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VIEWS, NEWS AND INTERVIEWS.

In view of the money stringency the following offer made by the Georgia Electric Light Company to the city council of Atlanta, Ga., is very suggestive of a prosperous condition of business in parts of the southern section of the country:

Actuated solely by a desire to assist the city in every way in our power, the Georgia Electric Light Company offers to lend the city $25,000 for four months. Should you wish to accept this offer we would suggest that the matter be referred to the finance committee with power to act. We will meet said committee at any hour it might name, when the rate and other details can be arranged. This offer is open until Tuesday, August 8, at 12 o'clock.

Georgia Electric Light Co.

The following ingenious device for trolley cars is announced: "Mr. W. E. Hamilton, of the Shreveport, La., Electric Street Railway, devised a plan by which the motorman of the car is not compelled to reverse the trolley pole when the car reaches the end of the line. The invention is a simple yet most effective one. It consists in raising the trolley wire at this terminus so that when the car stops the trolley pole is pulled into a perpendicular position by its springs. By this means, when the car starts back the pole is automatically reversed, and the motorman loses no time."

A German has taken out a patent for producing varnish from linseed oil by means of an electric current. The oil, after being purified in a proper manner, is thoroughly mixed and agitated with sulphuric acid and water, and subjected to the action of an electric current for two or three hours, so that the oxygen produced in the nascent state by the passage of the current converts the oil into varnish. The varnish so produced is said to be almost colorless and perfectly free from all mineral or metallic admixtures or impurities.

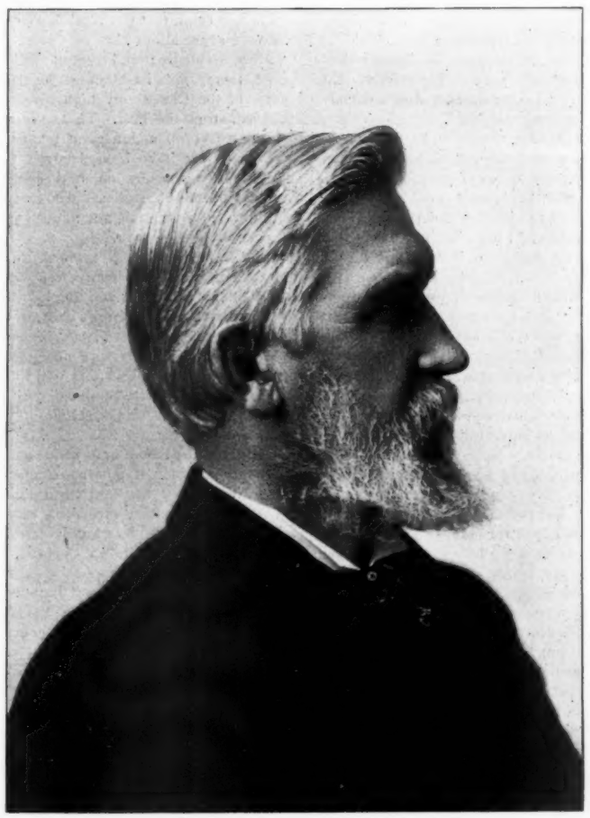
The advantages of the electric current for use in small motors are beginning to be appreciated in the St. Pancras district, London, where it is supplied during the daytime at a cheap rate. Power is useful to even small manufacturers, and many of them rent shops in which steam power is supplied at so much per week or month; but many do not want the power all the time the shafting is running, and those who could find the capital put in small gas engines, which they are loth to discard, even though they can get the electric current for three-pence a unit. New shops will, however, use it, as it is switched off and on with the least amount of trouble, and the payment is only for the current used. Brass-workers, makers of "small goods" for the organ and piano trades and other manufacturers who cannot put down expensive plant are beginning to find the electro-motors very handy and useful devices.

The electrical fountain which William Shute has given to the city of Lynn will be ready to be set up on the Lynn Common by September 15. The fountain is to have six tiers of water spray, the first to be a waterfall and the final jet to send a spray 40 feet into the air. Different colored electric lights will be so arranged as to give a beautiful display at night. The fountain set up will cost $2,000, and the cost of running it will be $150 a year.

Killing homeless dogs and cats, it is said, is the very latest use to which the scientific chief of police of Hartford, Conn., is putting electricity. In the rear of the station house he has had a cage rigged up with electrical connections. The cage is just large enough for a dog to stand in. The fore feet of the animal rest upon one electrode and his hind feet upon another. When he is in position an electric current is switched on.

A New Lamp Filament.

A new incandescent lamp filament is being introduced by Messrs. Shippey Brothers, Limited, electrical engineers, London. The new filament is of such a nature that it can be pressed into sheets or drawn into fine wire without difficulty. It is very strong and dense, and when carbonized is said to be capable of standing a voltage of 150 to 200 volts, and of being safely run at an efficiency of less than two watts per candle. At this output it is claimed to have a good average life. The new lamps are made both in vacuous and non-vacuous types, the bulbs in the latter case being filled in batches of 500 to 1,000 at a time with a highly attenuated vapor. For battery lighting the material of the filament, which has been named "Fiberite," can be blended with metallic substances and a good low resistance lamp thus obtained.



Professor Elisha Gray, Chairman of the Advisory Council, Chicago World's Fair Congress of Electricians, in Session this Week.

Business Outlook Improving.

The business outlook is growing perceptibly more encouraging. After a while the people will realize that they have permitted themselves to be frightened by shadows.—*N. Y. Morning Advertiser.*

THE ELECTRICAL CONGRESS.

An International Meeting of Electricians.

The Delegates From New York—Pleasant Stop at Niagara Falls—The First Session of the Congress—Many Prominent and Noted Electrical Workers in Attendance.

(Special Dispatches to the Electrical Review.)

Chicago, August 21.—The first session of the World's Fair Congress of Electricians was called to order at 3 P. M. in the Art Palace on the lake front. The nominating committee announced the following officers: Honorary President, Von Helmholtz; chairman, Prof. Elisha Gray; vice-presidents, Weston, Preece, Mascart, Ferraris and others. The attendance was quite large, and great interest in the proceedings was expressed.

Among the prominent electricians in attendance were noticed Von Helmholtz, Preece, Ferraris, Hospitalier, Mascart, Ayrton, Carhart, Weston, Chief J. P. Barrett, Dr. Hornsby, Prof. Lispenard Robb, Prof. Andrew Jamieson, F. W. Tischendoerfer, Prof. Dolbear.

Albany, N. Y., August 19.—When the New York Central's 7.30 express rolled out of the Grand Central Depot this evening, bound for Chicago, a Wagner special palace car contained a jolly party of 20 ladies and gentlemen—the former bent on seeing the World's Fair and the latter going to the World's Fair Congress of Electricians. Mr. C. O. Baker, Jr., an experienced traveler and master of transportation to the Congress, had made every possible arrangement for the pleasure and comfort of the party under his care. The trip up to this point has been exceedingly pleasant and agreeable. It was at first expected that a larger party would go on this train, but for various reasons many have started ahead of us. Von Helmholtz, Preece, Ayrton, Hospitalier, Mascart and others of the visiting foreign electricians are already in Chicago.

To-morrow we stop at Niagara Falls for

about half a day, to inspect the Falls, the great power plant and the electric railway, and to take a view of things from the lofty observation tower, which we have kindly been invited to visit. At the Falls we expect to meet ex-President C. R. Huntley, of the National Electric Light Association, who will come up from Buffalo.

In the smoking compartment is a group of "old stagers," some of them deep in an obstruse mathematical problem. The ladies and non-smokers are holding an animated conversation on the anticipated World's Fair.

Here are the names of our band of travellers :

Mr. and Mrs. Chas. McIntire, C. O. Mailloux, Prof. Wm. Lispenard Robb, Prof. Andrew Jamieson, Stephen D. Field, H. H. Fairbanks, Chas. Cuttriss, H. L. Shippy, H. A. Reed, son and daughter, James Pentz, Geo. M. Phelps, Mr. and Mrs. C. O. Baker, Jr., Julian A. Moses, Capt. A. de Khotinsky, E. A. Colby, Charles Proteus Steinmetz.

J. A. M.

Where to Advertise for the Best Returns.

The advertising manager of one of the largest firms in the East says :

"There is one thing I am satisfied of—there is no method of advertising that can compare with regular, legitimate newspaper advertising. I have tried them all, and I know. I have spent money building signs. I have spent money on annuals. I have spent money on cards and circulars. I have spent money on all the different schemes, but nowhere do I get as good results as I do from newspapers. I have tested the question until I am perfectly satisfied. I have tried it in all ways. I have taken two towns of the same size and covered one with newspaper advertising, while on the other I have tried signs, cards, circulars, and that sort of advertising. Invariably I sell more goods and get more results from the town where I used the papers. It is like this : If a man is driving along and sees a sign, he is thinking of something else, and it may make no impression on him. When he picks up a newspaper he has his mind on reading and he reads whatever he sees. It may be the advertisement and may not, but he is looking for something to read, and sooner or later he will read the advertisement. After my experience I am going to advertise in the papers hereafter."

The Infanta's Autograph Farewell.

A graceful souvenir of the visit of the Princess Eulalie to this country appears in the September number of Demorest's Family Magazine—the World's Fair number. It is the Spanish Infanta's autograph message of farewell and thanks to the American nation, accompanied by a letter from her official attendant, the Duke of Tamames, to Demorest's, echoing her sentiments of appreciation and esteem. The autograph letter is accompanied by pictures of the Infanta in five different poses and costumes, forming an introduction to the superb issue containing over 300 illustrations, including the finest collection of views of the Columbian Exposition that has yet appeared. The preference of the Infanta for *Demorest's Magazine*, shown by her selection of it as the official medium of publication for her farewell, in view of the fact that the honor had been sought by almost every newspaper and magazine of standing in New York, proves that the popularity of *Demorest's* remains as high as when it was made the medium for the distribution of Mrs. Harrison's beautiful "Orchid" picture, painted by her at the White House, and dedicated "To the Mothers, Wives and Daughters of America."

LITERARY.

Fred. J. Miller, one of the editors of the *American Machinist* and a member of the American Society of Mechanical Engineers, has written for the September *Scribner* an article in the "Men's Occupations" series describing the life of "The Machinist," with illustrations from life by O. H. Bacher.

Gustave Kobbé describes, in *Scribner* for September, the remarkable high tides of the Bay of Funday, with illustrations from photographs which show the reversing of the current of the St. John river.

AN INTERVIEW WITH WILLIAM H. PREECE.

THE CELEBRATED ENGLISH ELECTRICIAN GIVES HIS VIEWS ON SEVERAL INTERESTING AND IMPORTANT SUBJECTS TO AN "ELECTRICAL REVIEW" REPRESENTATIVE—HIS OPINION OF TECHNICAL JOURNALS, AMERICAN ELECTRICAL WORK AND ELECTRICIANS—HIS EXPERIMENTS ON THE TRANSMISSION OF ELECTRICAL POWER AT A DISTANCE WITHOUT THE AID OF WIRES—THE WORLD'S FAIR SYSTEM OF AWARDS CRITICISED—HIS FUTURE PLANS IN THE UNITED STATES, ETC., ETC.

William H. Preece, one of the representatives sent from England to the Electrical Congress at the World's Fair, stopped for a couple of days in New York before commencing his journey to the White City. His numerous researches and his wide-spread contributions to electrical science, valued on account of their intrinsic merit, have made him possibly the most widely known practical English electrical scientist of to-day.

Seated in one of the comfortable chairs of the Windsor Hotel, he greeted me in what I could immediately see was his accustomed pleasant, good-humored manner.

"Good morning," said he, "I received your card requesting an interview"—and he shook hands with the regular warm English hand-shake, which betokened the genial nature behind it.

"You are fortunate in finding me in," he continued, "for I had expected to leave for Chicago to-day, but a most unexpected spell of sickness prevented my departure, so here I am, forced to remain indoors until to-morrow, when I shall leave New York."

Upon being assured that his illness was of but a temporary nature, I remarked that now, above all other times, it was fortunate that his recovery was rapid.

"It was kind of you to make mention of an interview with me, published in London *Lightning*. By the way," he added, "it is a very bright little paper, is it not ?"

"What do you think of the American electrical journals ?" I inquired.

"They are American." And this answer speaks for itself. Anyone acquainted with American methods will appreciate this compliment. "But I am pleased to say," continued he, "that I admire the style of the ELECTRICAL REVIEW. It is bright, newsy, and above all, its simple and comprehensive style makes it most palatable to the public. It is readable, which cannot be said of many other electrical journals."

"In a recent conversation with Mr. Edison, he spoke of a very pleasant meeting he once had with you."

"Yes ; I have met Mr. Edison several times, and I look forward with a great deal of pleasure to a visit to his laboratory at Orange. He is an indefatigable worker, such as one seldom meets with."

"Are you acquainted with Mr. Tesla ?"

"Yes, indeed ; a charming gentleman, one who impresses you, as soon as you become acquainted with him, as a most intense thinker. He is, beyond any doubt, the most pleasant lecturer I have ever listened to ; his ease, his fluency, and his wonderful mastery of the English, as well as the French and German languages, make him a most charming speaker. Then his experiments are so unique and varied that one cannot fail to enjoy listening to him. I expect a brilliant lecture in Chicago, and I don't think that I shall be disappointed, for he is the most original thinker that I have ever met."

This was indeed a compliment, coming as it did from one great man, and spoken of another.

"How do the electric lighting systems of England compare with those of the United States ?"

"Lighting stations are everywhere ; almost every little village possesses its plant. In short, the distribution of the current in England is far greater than in this country."

"Is it the same with power ?"

"Not at all ; there is very little electric power employed throughout the kingdom."

"Is the use of the telephone general ?"

"The service is very poor; moreover, it is expensive, and for that reason the public do not take to it as you Americans do. The service is unsatisfactory."

"In these numerous small plants in England are arc lamps much used ?"

"Comparatively few; the service is almost entirely incandescent. What a difference is to be seen in the electric railways! Perhaps the change is more evident to me, for during one of my visits to the States I saw the first street electric railway in Cleveland; it was operated by the Bentley-Knight system."

"Do you expect to examine the Niagara Falls power plant ?"

"I am going to see the Falls with Professor Forbes. Ah ! there is a man whom the Americans have taken away from us. Most of his time will be spent in this country, for the undertaking is of such enormous proportions that his supervision is constantly required. We are to lose him." And Mr. Preece shook his head slowly from side to side as much as to say that such a man could not be easily replaced. England's loss, therefore, will be our gain. "But about the Falls, I expect to make quite an extended visit and, perhaps, carry back to England with me some interesting data."

"What do you think of the remarkable improvements made in this country during the last few years ?"

"The improvements are distinctly American ; they have been of a mushroom kind of growth and it is not improbable that the present financial depression is somewhat due to this inflation."

"Do you think that the World's Fair will meet your expectations ?"

"Most assuredly ; and that it will far exceed them, notwithstanding the many reports of the exceedingly high prices and hot weather at the Fair. These are very important factors, and a great many prospective visitors have been deterred from making the trip solely on that account. Why, out of the 100 gentlemen who intended visiting the Fair with me, not more than 30 will eventually come over.

"We have seen so many excellent illustrations, and have read so many well written articles in the American and English illustrated papers that our impressions are in a measure almost formed. These gentlemen, who will arrive shortly, are all practical men, most of whom are already well known to the American electrical public."

"What has been the direction of your recent work ?"

"Mainly in the line of units and standards and the transmission of power to a distance without the aid of wires. Concerning the first, I feel that electrical science has reached such a stage that rigid and universal units and standards are absolutely essential, and the sooner we have a complete system the more rapid and thorough will be our progress in that direction. As regards the latter, I am thoroughly convinced that I am on the right path. Up to the present I have obtained electrical indications at a distance of about three miles without the use of conductors. Magnetic waves have been transmitted, but the effects are of very weak intensity, sufficient, however, to show the feasibility of the plan."

"Mr. Tesla has made many experiments in that direction, and he has told me that were he suddenly to hit upon the solution of this great problem he sincerely believes that the intense shock would kill him," said I.

"Very likely ; he is so enthusiastic."

"What do you think of the system of awards to be employed at the Fair ?"

"It is very poor indeed. The awards, when they are received, really amount to very little. As a matter of fact, prizes are simply used by the recipients as an advertisement. To be selected by a number of prominent and capable men as the best of a class, is an honor which many covet; but where prizes are given indiscriminately there is nothing gained ; the possessor is merely one of a greater number. In the English and French systems there are four distinctions, viz., the diploma of honor, the gold medal, the silver medal and the bronze medal. The recipient of the diploma points with pride to this evidence of his superiority, the owner of the gold medal believes that he should have received the highest prize, the possessor of the silver medal believes that he has been badly treated, and the owner of the bronze medal is thankful that he got something, while he who is left without any recognition of his exhibit feels sorely grieved and disgusted. Imagine what must be the apathetic condition of affairs where each exhibitor feels sure that he is to receive a medal. The consequence is that the prizes have practically no value at all."

"That is indeed a sad condition of affairs," I remarked; "but what are your impressions of the exhibits themselves ?"

"That, of course, I can tell you better after I have examined them thoroughly, but all the illustrations that I have seen show that efforts have been made to fill up a great space and as a result, the material is spread out much more than is necessary. Electricity Building is an example of this. The quantity of apparatus is not sufficient to fill the floor space and we have great gaps, which give grandeur, it is true, but do not lend anything to the quality of the exhibition. However, upon my return I can tell you much more about my views of this country. I shall make New York my headquarters for a while and I shall make flying trips to the many places of interest around the city."

J. A. M.

Telegraphic Blunder Over the Price of Watermelons.

The Supreme Court of Georgia held, in the recent case of Hollis *vs.* Western Union Telegraph Company, that the measure of damages against a telegraph company for deviating from the terms of a message correctly reporting the state of the market for a particular article which the receiver of the message was induced by it to send forward for sale was the difference between the actual state of the market and the terms of the message, as erroneously transmitted, overstating it, provided the plaintiff's actual loss amounted to that much. In this case, says *Bradstreet's*, it appeared that the plaintiff's correspondent, in reply to a message inquiring as to the state of the market for watermelons, furnished to the company a message in these terms: "No melons on the market; will bring $12 to $15 per 100." The telegram, as transmitted by the company and delivered to the plaintiff, read thus: "No melons on the market; will bring $20 to $12 per 100." It appeared on the trial, by evidence on behalf of the plaintiff, that he sent a dispatch giving the correct market price of melons at the time, and quoting them at 15 to 20 cents, whereas in fact the message did not so quote them. The court held that a jury could infer from this evidence that the market was not as the witness remembered it, but as this message stated ; that is, from $12 to $15 per hundred, an average of 13½c. per melon, and that, as the average per melon indicated by the erroneous message was 16c., the plaintiff's loss may have amounted to 2½c. per melon; that the plaintiff's misconduct or negligence in trying to sell the melons himself instead of employing a proper agent to do so would not affect his right to recover, inasmuch as he realized less than the actual market price, and nothing appeared to suggest even a possibility that more than the market price could have been realized, and that in such case the state of the market at the point at which the watermelons were at the time the dispatch was received, and any actual sales which the plaintiff made or could have made at that point, had no relevancy on the question of measuring his damages, the state of the market from which the dispatch was sent being alone relevant.

Whew! Must Have Contained a Misspelled Word!

[*From Southern Mercury, Dallas, Tex., Official Journal Farmers' State Alliance.*]

The click of the telegraph now-a-days is but the echo of some hellish scheme to enslave our people. The truth rarely finds its route along this modern device for deception.

The Electric Lighting of the Great Ferris Wheel at the World's Fair.

A NOVEL AND INGENIOUS INSTALLATION BY THE WESTERN ELECTRIC COMPANY.

BY STEPHEN L. COLES.

The engineering fraternity who have visited the World's Fair are probably agreed that the greatest engineering feat in that congress of novelties is the Ferris Wheel. The idea is extremely simple, but its successful accomplishment on such a large scale and with such accurate results is indeed a wonderful achievement.

The readers of the ELECTRICAL REVIEW may remember that several weeks ago, in the course of a World's Fair article, one of the ELECTRICAL REVIEW'S correspondents suggested that an installation of incandescent lights on the Ferris Wheel would greatly add to its beauty and attractiveness at night. During the day the imposing structure is in itself a sufficiently distinguishing feature to attract attention, but in the darkness of night electricity must be called upon to play its part.

It is the purpose of this article to tell how the electric light installation has been carried out. It would not seem, at first thought, a difficult task to wire and light a structure of this character, and yet difficulties were encountered, as will presently appear, which called for considerable ingenuity and skill in the electrical installation.

First, a few words about the wheel itself. It stands almost at the center of the Midway Plaisance, the broad avenue separating at the wheel enclosure, passing to the right and left and coming together again beyond the enclosure.

The wheel is the property of the Ferris Wheel Company, and was designed by and built under the personal supervision of Mr. D. W. G. Ferris, a well known engineer of Pittsburgh. I have heard it said that Mrs. Ferris was of great assistance to her husband in this work. The wheel outfit represents an expenditure of about $400,000. The arrangement of the Ferris Wheel Company with the World's Fair officials is understood to be that until the receipts of the wheel reach such an amount as to cover its cost the Fair is not to get any money, but after this the usual 25 per cent. paid by all concessionaires goes to the Fair. The receipts have averaged $3,500 a day, it is said, so that before very long the World's Fair should be getting an income from the Ferris Wheel.

In general the Ferris Wheel consists of two skeleton towers supporting a hollow forged steel axle 33 inches in diameter, resting on bearings on the top of the towers, each of which is six feet square at the top, 40x50 feet at the bottom and 140 feet high; on this axle revolves a skeleton wheel 250 feet in diameter and rising to a height of 264 feet, the highest line of vision being 258 feet. The wheel carries suspended from its outer rim 36 cars, each having a capacity of 60 persons. The combined weight of wheel, tower and load is 2,100 tons. The structure is of steel construction throughout. For 50 cents passengers are carried round the wheel twice, the trip occupying about 20 minutes. The motive power consists of two Dick & Church heavy mill engines of 1,200 horse-power, the application of the motive force at the circumference of the wheel being by means of the proper sprocket chains and gearing. The construction of this great wheel is a good example of the close relation between theory and practice when the theory is properly developed. As an example it may be said that a piece of chalk held at the circumference of the wheel will show that it is only three-eighths of an inch out of true. The only error, if such it may be called, made by the designer of the wheel is in the steam plant. As was said before, the engines are of 1,200 horse-power, while 200 horse-power would have been amply sufficient to move the wheel. This, however, as is apparent, gives a very large factor of safety in the operation of the wheel.

FIG. 1.—THE GREAT FERRIS WHEEL AT THE WORLD'S FAIR—SHOWING SURROUNDINGS IN THE MIDWAY PLAISANCE.

The electric lighting features consist of two circles of 16 candle-power incandescent lamps, one on each side of the outer rim of the wheel 250 feet in diameter, two other circles of lamps, one on each side of the inner rim of the wheel 170 feet in diameter, two immense stars of lamps at the ends of the axle at the top of each tower, and lines of lamps up and down the towers and across the struts. There are also a number of lamps placed on the fences surrounding the enclosure and about the grounds inside.

On the 4th of July last the Chicago office of the Western Electric Company secured the contract to light the wheel, and in nine days they had 800 lamps in operation. This number was added to as opportunity offered, until 2,500 Edison 16 candle-power lamps are now in use. The electrical details of the installation were carried out by Mr. Edward Ellicott, of the Western Electric Company, who deserves great credit for the ingenuity displayed in this work. Mr. J. C. McMynn, of Chicago, was consulting electrical engineer for the installation, while Mr. Ferris and Superintendent Rice, of the Ferris Wheel Company, designed the placing of the lights. Current is supplied from a generator plant located in the boiler house, which supplies steam for the engines that operate the wheel. This power plant is 400 feet from the base of the wheel, the electrical feeders being carried in wooden conduits underground to a little terminal house at the base of one of the wheel supports where all the main cut-outs are placed. The generator plant consists of two 400 ampere compound wound 130 volt WesternElectric dynamos. These machines are rated at 130 volts, but are run at 120. There is 10 volts loss in the lines between the generators and the farthest removed lamp on the wheel.

In the conduits running from the power station of the wheel are seven mains, four 000, two 00 and one 0. From the terminal house there are two circuits of 0000 wire running up the inside of one of the towers to the hub of the wheel where special ring terminals attached to the brush studs are placed. The brush studs are 12 inches long and 1¼ inches in diameter. The blocks on the ends of the brush studs are 3x4 inches. The brush stud proper is 26 inches long. There are two solid copper collector rings 56 inches in diameter, 3 inches wide and five eighths of an inch thick placed on the hub of the wheel, and mounted upon an insulating collar which insulates them from each other and also from the wheel. The elliptical brushes, which rest on the collector

rings are each 1¼ inches wide. They are built up of 50 sheets of No. 36 brush copper wound in a ring and screwed and soldered to the ends of the brush holders. The fact that the wheel is revolved in opposite directions on each succeeding day renders it necessary that the brushes should operate in both directions. This variation in the revolution of the wheel is desirable so that the gearing may be equally worn on each side.

The connection from the mains, which supply current for the wheel, is made on the brush stud by two compression rings which

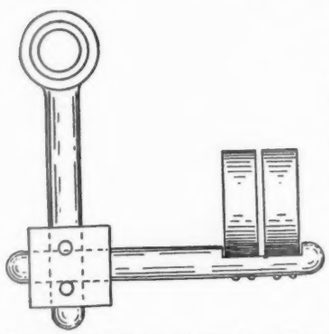


FIG. 2.—TOP VIEW OF BRUSH STUD USED ON FERRIS WHEEL, WITH BRUSHES ATTACHED.

slip over the stud inside of the block which holds the brush-holders. These brushes may be adjusted to any position or tension by moving the block on the brush stud. The illustration, Fig. 2, shows a top view of one of the brush studs with brush attached; Fig. 3 shows half of a collector ring with the special elliptical brush in contact, as it appears when the wheel is in operation.

The center of distribution is at the collector rings. From the terminal house at the base of the wheel support, branch circuits are led, which supply the lights that are placed in the buildings and on the fences. These are further protected by fuses at three sub-centers of distribution, each ten lamps being provided with double pole fuse cut-outs. The lamps are placed in porcelain receptacles which are made waterproof where contacts are exposed by being covered with rubber tape and painted with insulating and water-proof paint. There are 400 lights around the fences and in the buildings installed in this manner. The lights on the upright frames of the wheel are placed in porcelain receptacles and insulated as above described. The receptacles are fastened to and insulated from the diagonal lattice work by placing a wood rosette on each side of the iron lattice and screwing them together, the lamp and receptacle being screwed to the outside rosette. The wires—Okonite—are run on each side of the receptacle, connection being

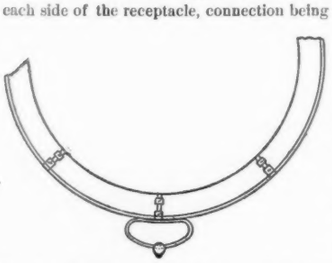


FIG. 3.—VIEW OF ONE-HALF OF COLLECTOR RING USED ON FERRIS WHEEL, SHOWING BRUSH AS IT APPEARS WHEN WHEEL IS IN OPERATION.

made at the side of each. These connections are all covered with rubber tape to prevent leakage of current to the iron framework of the wheel. The mains, which supply these lamps with current, are run from the terminal house to the center of the upright frames, where they are attached to the branch circuits. These main wires are run inside of the iron frame on glass insulators, which are placed on wood blocks, securely fastened. There are 250 lights on the uprights. The portals at the base of the uprights are lighted with 320 lights, arranged to conform to the angles and curves of the immense iron plates which form the base. Wood strips are bent in the shape of the arches and securely fastened, the porcelain receptacles being attached to the strip, about two feet apart. The wiring for these circuits is the same as that described for the upright frames, separate circuits being used for each arch and a center of distribution for each base.

The lights on the wheel are placed in four circles, two on each side of each rim. The outer rim is wired for 360 lamps on each side, and the inner rim is wired for 20 lamps on each side. The method of attaching the lamps to the outer rim is clearly shown in the sectional view, Fig. 4. It was found that the bolts which held the angle plates together projected a sufficient length beyond the nuts so that insulating blocks of wood, circular in form, could be screwed to them. As there is but two inches clearance on each side between the edge of the wheel and the supporting towers, it was necessary to set the lamps on the outside rim at an angle of 45 degrees, which admits of the lamp being seen when the observer is directly in front of the wheel. On the angular faces of these insulating blocks the receptacles are screwed, the lamps being placed in them and protected by rubber tape and waterproof paint. There are 30 lamps in each circuit, protected by a fuse cut-out on the branch main.

The outside circle of lights is divided into 12 circuits which are attached to the branch mains, run from the center of the wheel to the rim. Six of these branch circuits supply all the lights on the wheel, the two circles

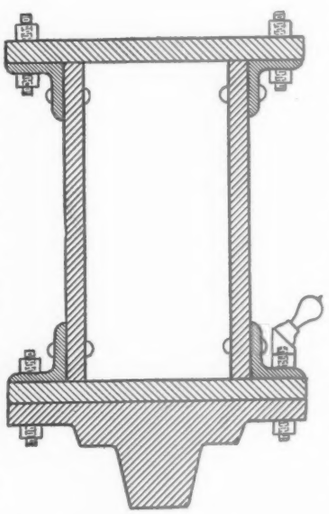


FIG. 4. — SECTIONAL VIEW, SHOWING METHOD OF ATTACHING LAMPS TO OUTER RIM OF FERRIS WHEEL.

on one side being fed by mains run across the wheel and attached to the branch mains at the point where the inside circle is attached. Each circuit is fused in such a manner that but a small section could be cut out in case of trouble with the wiring, and all cut-outs are placed so as to be accessible while the wheel is in operation. On the inside circles the lights are placed at right angles to the wheel, and are securely fastened to wood pieces driven into the angle of the inside rim of the wheel. Connections are made in the same manner as described for the outer circles, with the exception of the number of lamps on the circuits.

As may be readily seen this installation called for insulated wire of the first quality. Okonite, supplied by the Central Electric Company, of Chicago, was selected and is in satisfactory and successful use.

From an inspection of the wheel, as shown in the illustration, Fig. 1, the reader may conceive that the whole structure presents a most imposing aspect, but the view is even more grand at night, when every light is in full glow. The most beautiful effect is observable in the evening just when current has been turned on, and the wheel is shining bright with the setting sun for a background.

A Home for Newspaper Men.

Mr. Remington Vernam, the owner of Arverne-by-the-Sea, Long Island, generously donated to the International League of Press Clubs a site for a proposed home for aged and infirm newspaper men. A special committee, composed of Col. John A. Cockerill, editor of the *Morning Advertiser*, William Berri, proprietor of the Brooklyn *Standard-Union*, and Chas. W. Price, of the ELECTRICAL REVIEW, visited the site last week and were shown over the beautiful country by the liberal-hearted owner, Mr. Vernam.

It is located near Oakland, N. J., and the unanimous opinion of the committee was that the site was in every way admirably suited for the purpose. Some 25 acres, with a natural grade, so elevated as to command a charming view of the surrounding mountains, woods and valleys, with pure water and plenty of it, comprise the territory offered by Mr. Vernam. It is about nine miles from Paterson, N. J., an hour's ride from New York city, and conveniently reached by the Susquehanna and Western Railroad.

Mr. Vernam and his wife, who is also greatly interested in this most charitable work, intend to have the site surveyed and definitely located this summer and will then deed it to the League.

The committee in charge of the work for the League of Press Clubs consists of Messrs. Berri and Cockerill, and Hon. M. H. deYoung, proprietor of the San Francisco *Chronicle*.

GENERAL NOTES.

Bedford, Ind., will soon be equipped with telephone service.

The village of Branchville, Sussex county, N. Y., will be lighted with electricity. The electric light plant will be in operation next month.

The Missouri and Kansas Telephone Company will begin at once to extend its line from Harrisonville to Rich Hill, Mo., and Fort Scott, Kansas. This will be the longest telephone line in the West.

The stockholders in the Northern New York Telephone Company, the head office of which is located in Lowell, Mass., received, last week, checks for a semi-annual dividend of one and a-half per cent.

The Dayton, O., Electric Light Company filed for record last week with the County Recorder a mortgage to the Holland Trust Company, of New York. The amount named is $600,000, and covers all the property of the company, real and personal, rights, franchises, permits, &c., in that city.

Two important articles on "The Financial Situation" appear in the August number of the *North American Review*. The first is by the Comptroller of the Currency, Hon. James H. Eckels, who writes on "The Present Crisis," and the second, by Governor Pennoyer, of Oregon, is entitled "After the Four Hundred Years—What?"

The Brattleboro, Vt., Electric Light Company have just finished and will soon occupy their new power station. The building is of brick, one story high, with a large basement, and is 50 feet square. It will be furnished with five dynamos, a Rollins engine of 150 horse-power, a Fitchburg engine of 150 horse-power and two large boilers. In addition there is a 21-inch wheel, which, as there is abundant water-power, can be used to run the machinery.

The Marshall Telephone.

A NEW PRINCIPLE EMPLOYED IN TELEPHONIC RECEIVERS—ITS CHEAPNESS—ITS ARTICULATION REMARKABLE FOR ITS CLEARNESS AND LOUDNESS.

BY JULIAN A. MOSES.

Hello! hello!

I looked around—there was not a telephonic receiver in sight. Lying in front of me on the desk was a little pamphlet which bore the following upon its cover:

"Marshall's Telephone."

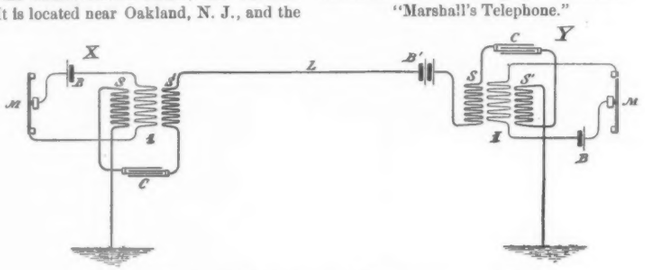
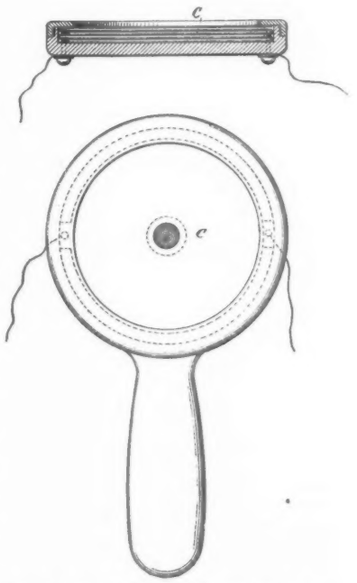


FIG. 1.—DIAGRAM OF MARSHALL'S TELEPHONE CIRCUIT.

Was this a telephone, or was it merely a description of a telephone? I picked it up. Imagine my astonishment when in clear and sharp tones it almost supernaturally declared, "I am Marshall's Telephone."

Was I dreaming, or was I in the halls of an enchanter who had power over inanimate things? Undoubtedly the pamphlet spoke to me, and as I turned its pages with a certain kind of reverential awe, in dulcet tones it told me of its history. Visions of Jack and the Beanstalk rose up before me; and here I was face to face with a book which I had but to open and in a human voice it told me the contents of its pages. This was even more wonderful than the Enchanted Harp.

But we are not living in an age of miracles,



FIGS. 2 AND 3.—CROSS SECTION OF MARSHALL TELEPHONE AND TELEPHONE IN RECEIVING BOX.

and this must have some explanation. Here is a case of spoken sermons in books. Let us look for the cause. The effect is astonishing. A book, a few pieces of tinfoil and two wires constitute this most simple device. It is nothing more than a telephonic receiver, an ordinary condenser compound of about 30 strips of tinfoil inserted in the binding of the pamphlet, the alternate strips connected with each other and terminating in two conductors, which are connected as described later.

On September 21, 1886, Mr. William Marshall, of New York, patented his invention, "a telephone system with speaking condensers in which a more perfect trans-

mission of the volume of speech can be accomplished than has been possible heretofore in systems of this kind."

The invention consists, essentially, in a telephonic system comprising speaking condensers and an induction coil at each station, each induction coil having two secondary wires and a primary wire, and the opposite ends of each secondary wire being connected to the opposite poles of the speaking condensers.

In the accompanying drawings, Fig. 1 is a diagram representing a telephonic circuit connecting two stations each with its transmitting devices and receiving telephones. Fig. 2 is a cross-section of the receiving telephone. Fig. 3 shows the telephone incased in the sounding box with its electrical connections. Fig. 4 shows another system of circuits in which the receiving telephone is placed in a local circuit. Fig. 5 represents the receiving telephone formed in the shape of a book, having its leaves connected at one extremity only and leaving the other ends loose, as shown in cross-section, Fig. 6.

Similar letters indicate the same parts in the several figures.

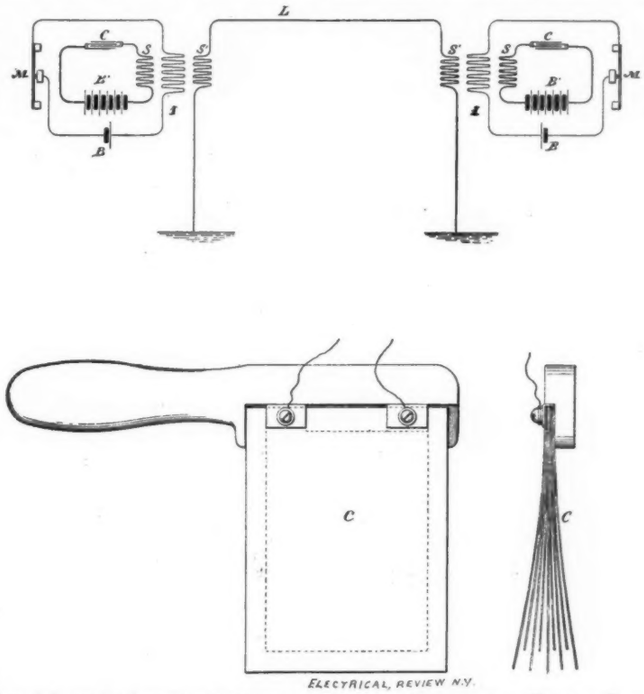
In an application for letters patent filed February 6, 1885, allowed May 29, 1885, and patented May 4, 1886, No. 341,259, Mr. Marshall described a receiving speaking condenser telephone, the opposite poles of which are connected with a line wire and a shunt or resistance coil. In this invention, however, he either connected the condenser plates at either pole with the opposite side of two secondary wires of an induction coil, or inserted the receiving telephone in a local circuit containing a polarizing battery, as hereinafter described, and specially shown in Fig. 4 of the drawings.

It has been claimed that a condenser can be made to speak; but he discovered that unless the line wire connecting the stations is made continuous, as by shunting the speaking condenser, or by the method here described, the articulation and volume of speech are not perfect, being scarcely audible when more than one speaking condenser are inserted in the line of communication.

In the diagram represented in Fig. 1 the poles of the speaking condensers C C, are connected with the opposite ends of the secondary wires S S', of the induction coil I, the primary of which includes the battery B, and microphone transmitter M. The line wire has in circuit the battery B', which polarizes the speaking condensers C C. When the microphone M, at station Y, is spoken to, the current induced into the line reaches the induction wire S'. at station X, changing the polarization of the plates of the condenser C, with which it is in contact, directly, and the opposite plates of the same condenser inductively, with the same direction of current through the other secondary wire S. With this organization of circuit the opposite plates of the condenser vibrate in unison and with much greater force, as will be readily understood. The condensers C C speak much louder when the metallic plates are in part not touching or in contact with the insulator, allowing a space sufficient to vibrate freely and to impart to the air the sound which is transmitted from a distant station, so as to be easily heard. In fact, the speaking condenser should be built up in the same manner as if the leaves of electrometers were intersected into each other, substantially as shown in Fig. 6, one end only of the plates being fastened. In Fig. 3 the middle of the plates are made loose by pressing the circumference together, the plates and insulators bulging sufficiently in the center to separate themselves. In Fig. 4 another organization of circuit is shown, wherein the polarizing battery for the condenser is placed in a local circuit, instead of being placed in the line wire. The induction coil has two secondary wires, as that shown in Fig. 1. The current induced into the line by the action of the microphone affects the speaking condenser inductively through the two secondary wires of the induction coil.

The two methods of circuit shown in Figs. 1 and 4 can be combined, if desired, by organizing one station as shown in Fig. 1 and the other station as shown in Fig. 4; or one of the speaking condensers may be placed directly on the line wire, the line having its polarizing battery, and the other speaking condenser placed in a local circuit, as shown in Fig. 4.

The foregoing description is mainly in reference to the system, but by all means the most remarkable part of the invention is the telephonic receiver.



FIGS. 4, 5 AND 6.—SYSTEM OF CIRCUITS AND RECEIVING TELEPHONE IN FORM OF BOOK.

There is possibly no manufacturer of condensers for various uses better known than Mr. William Marshall. His instruments, which he manufactures under his personal supervision, are conceded to be the best in the market. In fact among a number of them which were recently recalled for adjustment, there was found one which was absolutely accurate throughout its entire range. This is a most unusual occurrence, and the maker of this condenser deserves much credit for this achievement.

WILLIAM MARSHALL, INVENTOR OF THE MARSHALL TELEPHONE AND MARSHALL CONDENSERS.

Last week a number of prominent men, among whom were Mayor Gilroy, E. J. Slattery and Judge Dugro, were present at a test given at Saratoga Springs, between that city and Albany. The receiver, which is shown in Fig. (7), consists of a mere pamphlet interleaved with strips of tinfoil. This was placed in the center of the table, and every word which came from it could be distinctly heard at the farthest corner of the room.

The book may be opened, squeezed or bent without affecting the volume of the sound. The vibrations may be distinctly felt; in short the book speaks for itself. There are other forms of receivers, one of which is the hand form and consists of annular rings of paper and tinfoil, the outer rim only of tinfoil being compressed, the inner ring being free to vibrate.

Mr. Marshall, whose finely marked features we illustrate herewith, is a modest and unassuming inventor. His workshops, in rooms 2 and 4 University Building, New York city, are filled with the latest standards and testing apparatus, enabling him to produce most accurate instruments, which have made his name famous among electricians. His telephone will no doubt produce quite a stir in electrical circles. Its simplicity, its cheapness, and the remarkable clearness and loudness of the articulation, prove it to be a valuable improvement in the science of telephony.

SOME SCATTERED SPARKS.

The Martinsville, Ind., electric light plant is to be sold at public auction.

The Calgary Electric Light and Heating Company's tender for lighting Calgary, Manitoba, has been accepted. This new company offers private lights at 60 cents per light per month, and street lighting at the lowest rate in Canada, it is said.

The Newark Railway Company has leased all its street railroads in Newark, N. J., to the New Jersey Consolidated Traction Company for a term of 999 years. The lessee stipulates to pay as rental $30,000 the first year, $60,000 the second year, and $105,000 for all years thereafter. The Traction Company gave bonds to assume the indebtedness of the lessor.

Suit has been brought by the Sprague Electric Railway and Motor Company, of New York, against the Winchester Avenue Railway Company, of New Haven, Conn., for infringement and damages growing out of the use of certain devices and appliances, the patents on which are owned by the plaintiff corporation. The case was returnable to the United States district court, of New Haven, this month.

At the annual convention of the Northwestern Electrical Association, which closed at Madison, Wis., recently, the following officers were elected: President, Carroll Collins, of Green Bay; vice-president, C. C. Page, of Oshkosh; secretary and treasurer, T. A. Pamperin, of Oconto. A large number of expert electricians were in attendance at the convention, and many interesting papers on electrical subjects were read.

The question has often been raised whether or not the sender of a telegram was obliged to use the blanks provided by the telegraph company for the purpose. This point has been decided in the South Dakota Supreme Court. The court held that the Western Union Telegraph company, against whom suit was brought, must accept messages tendered whether or not written upon the regular telegraph blanks. The plaintiff evidently combined enterprise with public spirit in his method of testing the point. He was awarded $50 damages under the decision and has 40 other cases pending

The Edison electric light plant, of Topeka, Kan., caught fire recently and was badly disabled and damaged to a large amount. The effects of the fire were widespread, as from this plant every motor in the city is run. Work came to a standstill in most of the printing offices in the city, in dozens of other shops, bakeries, laundries, etc., and nearly all the elevators were stopped. A large portion of the incandescent lights used in the city are also from this plant. The Topeka *Press* took its forms to the Kansas Newspaper Union, to be run off; the *Advocate* was sent there also, as the K. N. U. has its own power; the *State Journal* procured an old traction engine and, placing it in the alley, got off promptly on time. The Edison people put a reserve dynamo in direct connection with the *Capital's* motor, and its press-work was done at home.

FIG. 7.—BOOK RECEIVER, MARSHALL TELEPHONE.

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The voice of the incandescent lamp makers is now heard in the land.

There is a new incandescent lamp in the field. Boston is its home, and its name is the "New Beacon."

You will find the ELECTRICAL REVIEW particularly interesting and up-to-date this week. Also next week and other weeks.

The idea of having an exhibit in New York at the Grand Central Palace of the prize winners at the World's Fair is a good one. We wish it all success.

The electrical illumination of the great Ferris Wheel at the World's Fair adds the final touch to a marvelous engineering feat. The ingenious manner in which this unique electric light installation has been successfully carried out is described on another page in this issue.

Marshall's telephone, described in full on another page, is indeed a wonderful instrument. The telephone fraternity will doubtless be greatly interested in this invention, which is worthy of Mr. Marshall, who is well known for his work in manufacturing condensers and other electrical apparatus.

As we go to press the great World's Fair Congress of Electricians has begun its deliberations. There are many knotty points in electrical engineering to be settled and compromised and the representative character of this body of electrical workers is sufficient assurance that as satisfactory results as possible will be reached.

ELECTRIC TRACTION IN ITALY.

The question of electric traction is becoming quite a general one throughout Italy.

There has just been opened for traffic an electric tramway running between the city of Milan and the town of Monza, a distance of 10 miles. The line is on the accumulator system, the accumulators employed being of the Gandini type, constructed by the Societá Franco Italiana.

To the esteemed foreign electrical workers who are attending the Electrical Congress the ELECTRICAL REVIEW extends a very cordial welcome. We trust each and every one will enjoy this visit and find something to interest them in our electrical accomplishments.

Various conditions point to a let up of the hard times. We sincerely hope that such may be the case, and we also believe that the autumn will witness a revival in many lines of business which have suffered severely for several months past.

Who will say now money is scarce in electrical circles! The electric light company at Atlanta, Ga., last week loaned the city $25,000 for four months to help meet maturing obligations. The *Constitution* of that city highly commends the electric company and its president, Mr. H. M. Atkinson, for this voluntary act at a time when it was almost impossible for the city to raise the money.

We feel extremely proud, and with justice we think, over the high compliment paid the ELECTRICAL REVIEW by the great English electrician, William H. Preece. He said to one of our representatives, in the course of a very interesting interview, which appears elsewhere in this issue:

"I am pleased to say that I admire the style of the ELECTRICAL REVIEW. It is bright, newsy, and above all, its simple and comprehensive style makes it most palatable to the public. It is readable, which cannot be said of many other electrical journals."

Examiner F. A. Seely has just published a primary report to the Commissioner of Patents upon the Requirements of Senate Resolutions of March 3, 1893, the subject of which is "Patent and Trade-Mark Laws and Conventions." Under the heading "Patent Laws" appears the following Sec. 4887 which, it may be advisable to keep in mind in view of the expected discussions concerning the expiration of the Edison lamp patent: "Sec. 4887. * * * * But every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one at the same time with the one having the shortest term, and in no case shall it be in force more than 17 years."

TELEGRAMS BY MESSENGERS.

Few realize the risk they take in sending an important telegram unrepeated. Some time ago a lady wrote out a telegram, part of which was in cipher, and delivered it to the messenger boy, paying him the regular rates. This young artist in crime, thinking the cipher words unimportant and useless, simply rewrote the message, leaving them out, pocketing the difference in price. As the cipher was a question which necessitated an immediate answer, its omission was speedily noticed, and inquiries and explanations followed. As the telegram received at the office was intact, and from the sense there appeared no words missing, it was difficult to prove that the message had been tampered with. The company practically admitted the fault to be theirs by promptly discharging the boy. No damages, however, could be recovered, as it was against the policy of the company to hold itself liable for any damages resulting from the inaccurate sending of unrepeated messages. The question which is thus presented is: Are we at the mercy of the ofttimes infantile telegraph boy? Would it not be advisable to write the message and so enclose it in an official envelope that would effectually prevent any evil designs being attempted upon it *in transitu?* By this means the person who would be held responsible would be the receiving clerk, thus reducing the chance of intentional mutilation of the telegram to a minimum. If not this, then a system of check, or some means to keep the messenger boy what he is intended to be, *i. e.*, a carrier, and nothing else.

LETTERS FROM A LABORATORY.—LIX.

BY JULIAN A. MOSES.

At a recent meeting of a microscopical society, among the many interesting slides and other attractions exhibited there was one table which, by its novelty, drew quite a crowd of interested onlookers. With the exception of the one on this table all the other microscopes were situated where the rays from many different forms of lamps and gas burners could shine upon their mirrors; but this one was far away in a dark corner apparently distant from any source of light; yet each person as he looked down the body of the microscope perceived the magnified object on the slide, and the field of vision brilliantly and evenly illuminated. A closer inspection, however, proved that the source of the illumination was a small incandescent lamp ingeniously arranged as follows:

The lamp was situated in the focus of a small silvered parabolic reflector whose wide end was covered by a blackened brass plate having a short brass tube screwed into it. This part of the apparatus looked like a swab used by gunners for cleaning out the bore of a cannon after a shot has been fired. Inserted into the small tube was a solid rod of clear glass having both ends ground perfectly plane, polished and at right angles to the axis of the glass rod. This rod may be inserted loosely or it may be soldered to the tube. It was blackened on the outside with Brunswick black or some dark japan, so that there was absolutely no light visible along the rod other than that which was projected from the end farther away from the light. The whole apparatus was so adjusted that this beam of light was directed immediately below the object on the slide, thus avoiding all stray rays. A very small plano convex lens cemented to the end of the rod by means of Canada balsam served the purpose of concentrating the entire beam upon the object under examination. The great facility with which this was done showed that the apparatus was equal to, if not superior, to the Abbe condenser system.

There was sufficient illumination for the manipulation of the objects, and the great comfort obtained by the use of this so-called "dark lantern" more than paid for the cost of operating, which was slight. This arrangement rendered the use of the eye shade, a device which is often used by the amateur microscopist, entirely unnecessary, another point in its favor.

The total refraction of the rays of light made it possible to have these light conducting cylindrical glass rods of almost any shape. A bend may be made without any difficulty, and there can be little doubt but that they may be used as scale illuminators in well constructed electrical instruments.

The heat arising from the enclosing of the incandescent lamp in the reflector may be done away with by drilling several holes at the top and bottom of the encasing metal. A draught will thus be produced which will cool the heated interior. This heating is sometimes so intense that in one particular instance, where a green glass incandescent lamp was used in a parabolic reflector, some of the reflected rays were caught by the green glass and absorbed, and in a comparatively short time the globe was softened, thus causing it to collapse.

The portion of the glass rod to be soldered to the brass tube should be prepared as follows: Coat it evenly with a dilute solution of platinic chloride, and deposit the metallic platinum by dipping into an essential oil, such as lavender. A bright grayish conducting film is thus obtained, which may be electroplated in a sulphate of copper bath. If an even and pliable coating is obtained, it may then be treated as an independent close-fitting tube, and may be soldered accordingly. Care should be taken, however, not to heat it too much in the act of soldering, for the unequal expansion is liable to cause either a fracture or a loosening of the copper coating. If this should happen the glass rod may be cemented into the tube with some material, such as plaster of paris, which is not affected by heat.

CORRESPONDENCE.

OUR BOSTON LETTER.

George M. Angier, general agent of the Mather Electric Company, of this city, while in New York recently, secured a contract for the complete equipment of a central lighting station for one of the principal cities of Mexico. The contract is an exceptionally good one, and includes engines and boilers, as well as all the apparatus, wire and general supplies. The contract was secured in the face of hot competition, and reflects great credit on Mr. Angier, as well as the company he represents.

After a Long Period of quiet and seeming inactivity, the Beacon Vacuum Pump and Electrical Company, of this city, have at last thrown off the cloak of silence, and declared themselves once more a prominent figure in the field of incandescent electric lighting. This company made a long and determined fight against the General Electric Company last winter, and their celebrated Goebel defense at the time of the trial of the injunction suit, created an unusual amount of interest in electrical circles throughout the country. When the injunction was finally granted against them and their factory closed, they still maintained that they were not yet beaten, and would have a new lamp on the market within the next six months. That there was some foundation for this confidence on their part has just been demonstrated, and that they have not been idle during the past few months is obvious from the stand they have now taken, and from the results they have to show. It has been pretty generally known for some time that they had a new lamp, and a good one at that, but no public announcement was made by them until they were assured, by some commercial tests, that the lamp was all they claimed for it. These tests have been made, and they now have over 75,000 lamps in actual commercial use, and giving entire satisfaction. The Beacon Company claim to have the only really non-infringing lamp on the market, and will guarantee their patrons against any loss or inconvenience through litigation. While it is fully correct on every point by their patents, they have no desire to create a monopoly, and have signified their willingness to license other manufacturers, whose works are at present idle, to make their lamp, and on such a basis as will enable them to turn them out, royalty added, at a less cost than they could make lamps of the Edison type. This is certainly a most liberal offer, and will no doubt be appreciated by the trade. The lamp has been christened the "New Beacon," and is extremely neat in appearance as well as simple in construction. No platinum is used, and the material for closing the neck of the lamp is a peculiar compound of a nature entirely distinct from glass, and through which the leading-in wires pass. The only other material used is a supporting disk of mica, and the cost of manufacture has been considerably reduced. Indeed, so thoroughly is the company convinced of the superior merits of the new lamp that they would not go back to the manufacture of the old type even were they free to do so. Their factory on Irvington street in this city has been in operation for some little time, and they announce their readiness to fill orders immediately. A technical description of the new lamp and a sketch of the inventors will be found elsewhere in the REVIEW, and will no doubt prove interesting reading to the trade. Again has American pluck and ingenuity overcome all obstacles, and turned apparent defeat into victory.

The Rival Supporters of the two great motive powers of the world, electricity and steam, became involved in a little controversy a day or two ago, and for a time managed to make things exceedingly lively and interesting in their immediate vicinity. The little town of North Abington, Mass., was the place selected for their meeting, and the stirring events which followed will afford a fruitful topic of conversation for the local orators of this favored community for some time to come. War, in all its grim reality, was waged with unabating fury, and charges, countercharges, retreats, flank movements and deeds of individual valor crowded thick upon each other. The fact that the troops were un-uniformed, and that their armament consisted of shovels, pickaxes, paving stones, clubs and rifles, detracts nothing from the glory of the struggle, and even the cooling effects of a powerful stream of water from a nozzle in the hands of well trained firemen failed to quench their ardor, though it dampened it considerably.

The conflict was brought about by an attempt on the part of the officers of the Abington and Rockland Electric Road to lay their tracks across the roadbed of the Plymouth division of the New York, New Haven and Hartford Road, at Abington, to complete their lines between Rockland and Whitman. They had obtained their charter and permission from the railroad commissioners to cross the New York, New Haven and Hartford tracks at this point, but the railroad company objected on the ground that if they sanctioned the grade crossing they would be held liable for any accidents which might occur thereon. They made preparations to forcibly prevent the crossing being made, and their end of the argument was upheld by 250 laborers under the command of Supt. John C. Sanborn, of the Plymouth division. The opposing force consisted of patriotic and enterprising citizens, all of whom favored rapid transit and whose battle cry was "put the road through." The street railway company very sensibly took no part in the controversy beyond laying their rails up to the crossing on either side, after which, having such warm and able supporters, they were content to sit on the fence, as it were, and watch results. The results were not long in coming, for as soon as the railroad men began tearing up the rails within their limits they were met with a volley of stones, clubs and other missiles, accompanied by a determined charge by the local forces, which temporarily drove them back. They soon rallied, however, and gave as good as they received. The battle continued with varying fortunes for an hour and a half, at the end of which time they had succeeded in tearing up the rails within their territory, and retired in good order. Their victory was only temporary, however, as while the fight was on the officers of the electric road succeeded in obtaining an injunction against the railroad company, and their tracks will be relaid. Both parties claim a victory, the electric road from the fact that they get their crossing, and the railroad company from the fact that they have demonstrated their opposition, and cannot now be held responsible for any accidents which may occur. While no deaths resulted from the conflict, there is a long list of injured men on both sides, some of which may prove serious. It is to be hoped that events of this kind may prove rare, and that rival corporations may be able to adjust their differences without resorting to such forcible measures. H. G. T.

Boston, August 19.

Wanted: A Battery for Lighting Traveling Buoys.

TO THE EDITOR OF ELECTRICAL REVIEW:

In December, 1888, I was granted a patent on a marine life line and message carrying buoy.

This buoy is a hollow sphere having a sleeve running through it containing one outside opening. The line and messages are placed in a tube and slipped into the sleeve in the buoy.

The line is N. S. No. 4, a little smaller than an ordinary lead pencil. It is soft linen and treated to warm paraffine to make it pay out smooth.

Buoys are from 18 inches to 3 feet diameter, and made as light as possible to retain requisite strength. Their motive power is the wind and waves.

Wind to or quartering on shore, in case of wreck, the free end of the line is made fast on ship board and the buoy pitched into the sea. Being very light and buoyant, it is driven over the waves to shore, paying out the line as it goes, almost as fast as if it had no line, for there is but the slightest strain in paying it out. The case would be different were it to drag the line through the water.

Now to the point: A short time after I received my patents I wrote you inquiring about an electric light to use on them that would burn for one, two or three hours (my patents call for it). You did not give me much satisfaction, but said electricians were working for something that might answer with a dry battery. I now write to ask if they have succeeded. My patents also call for an alarm sounder. I would like, if possible, to have the battery run both light and sounder.

Will you kindly let me know if there is anything out yet that will suit my purpose?

WILL B. SMITH.

Lawtey, Fla., August 15.

Baker & Company, the platinum refiners, of Newark, N. J., have permanently secured the services of Mr. E. A. Colby, the well known electrician. Mr. Colby will devote his time and attention toward conducting a series of experiments, with a view of assisting the firm in producing the best possible product in their line. Baker & Company are to be congratulated over securing the services of this accomplished inventor and electrician, and also Mr. Colby is to be congratulated on uniting himself with a company so strongly established, and one that is progressive at all times.

Wall Street and the Electrical Stock Market.

As Wall Street goes by contraries, the statement of averages issued to-day, and showing an increase in the reserve, was reflected in lower prices. The week has been a dull one, the only activity being caused by the alternate advances and declines of surface speculation.

Money on call has been quite easy all the week, while the markets for time money and commercial paper have been closed to almost all customers. The New York clearing house issued $865,000 more loan certificates and the Boston clearing house issued $650,000 and retired $250,000. Early in the week the premium bid for gold and currency almost disappeared, but revived later to 2½ to 3 per cent. Over $11,000,000 in gold has been imported this week, and engagements at the Bank of England for import have aggregated nearly $6,000,000, while there is afloat about $2,000,000 engaged prior to the week's opening. Money on call to-day at 3 per cent. was inactive.

As compared with the final prices of last Saturday the list is lower with a single exception, Distilling and Cattle Feeding, which was 2¾ per cent. higher. The net declines of the more important electrical stocks are in General Electric, 6⅞ per cent., and Western Union, ¾ per cent. Western Union was bid up by brokers who have been active in it for several weeks. The stock is said to be oversold.

During the week the sales of General Electric aggregated 94,900 shares. The highest price was 44½, the lowest 37, and the closing to-day 38⅜. The net loss for the week was greater in General Electric than in any other active stock. The sales of Western Union amounted to 50,200 shares, the highest price being 77, lowest 74½, closing 76⅝, showing a net loss of but ¾ per cent. for the week.

General Electric is rumored to be economizing to a greater degree than ever, and it is hinted that expenses will be reduced in departments as yet not seriously affected by the pruning knife.

The closing prices of electrical stocks on the Boston stock exchange to-day were:

	Bid.	*Asked.*
Boston Electric Light	—	105
Edison Electric Illuminating	—	125
General Electric	38¼	38⅛
General Electric, Preferred	70	—
Westinghouse Electric	—	17
Fort Wayne Electric	3	3¾

The interest upon the scrip of the Westinghouse Electric & Manufacturing Company to September 1 will be paid to the holders of record on that date. Scrip books will be closed August 23 and opened September 2.

There has been some discussion as to the bearing of the securities which are to be issued against the deposit of General Electric collateral upon the General Electric debenture bonds. The clause in the debenture bond mortgage bearing upon the matter follows:

"The company agrees with the holder that it will not at any time mortgage or pledge any property or franchises belonging to it at the date hereof, without also thereby expressly securing the principal and interest of this debenture bond (if outstanding at the time any such mortgage or pledge shall be made) ratably with any and all other indebtedness secured by such mortgage or pledge. And in the event of such mortgage by this company, the holder hereof shall, upon demand, be entitled to receive in exchange for this debenture bond a mortgage bond for the same principal sum, but bearing interest as therein expressed."

The attitude of General Electric in the matter seems to be that it is not proposed to issue any new mortgage or to impair the rights of the debenture bond holders. It is proposed simply to group certain securities into a pool or collateral trust in order to finance the operations of the company more readily and to the advantage of all interests. The scheme is expected to add to rather than to take from the value of the property. The following is taken from to-day's issue of the *Boston News Bureau:*

"Boston.—The Boston *Evening Telegram* late yesterday afternoon had quite a circulation on State street, as a three-column display of headlines shrieked about General Electric, and New York robbing New England of $50,000,000 by the consolidation of its Edison Electric Company with the Thomson-Houston Electric Company. It declared that the Boston people were robbed by the New Yorkers, and that the New York company had a floating debt of over $8,000,000 which was not shown upon the books of the company. This forced the General Electric Company to issue bonds after the consolidation to pay this debt. It intimates in the small paragraphs of reading matter under the headlines that the New Yorkers sold through our Boston operator over 70,000 shares and have bought it back at a decline, and that President Coffin has "got to join McLeod and the long list of men who have pulled Morgan chestnuts from the fire."

"Most of this the Boston News Bureau has reason to believe is not true. It is, however, true that the Edison Company was not found after the consolidation to be financially so sound as the Thomson-Houston, and that the New Yorkers have been the main sellers of the stock."

NEW YORK, August 19.

World's Fair.

Visitors registered at ELECTRICAL REVIEW headquarters, period ending August 12, 1893.

H. C. Adams, Phillips Insulated Wire Company, New York.
D. C. Allen, Paterson, N. J.
I. Bailey, Madisonville, Ky.
H. I. Bennett, Colorado Springs, Colo.
P. S. Bemis, Jr., Chicago.
Wm. Burger, Williamson, Pa.
H. H. Cooper, Boston, Mass.
C. F. Cutts, Carson City, Nevada.
A. E. Clark, Wyandotte, Mich.
Edwin P. Crocker, Charles City, Ia.
A. C. Curtis, Menlo, Ia.
James Clark, Elmira, N. Y.
R. J. Cantrick, Toledo, Ohio.
Wm. W. Christie, Milwaukee, Wis.
E. K. Dixon, Blairsville, Pa.
N. E. Dolbear, Tufts College, Mass.
Geo. H. Davis, Cambridge, Mass.
H. C. Friday, San Francisco, Cal.
J. E. Eldred, Jr., Milwaukee, Wis.
E. H. Fox, Spain.
J. J. Forbes, New Orleans, La.
L. E. Frorup, New York, General Incandescent Arc Light Company.
W. M. Gregory, Jonesville, Mich.
Wm. L. Goeth, Milwaukee, Wis.
Iky Gordon, St. Petersburg, Russia.
F. P. George, Chicago.
Louis J. Gerson, Philadelphia, Pa., Gerson Electric Company.
H. S. Humphrey, Indianapolis.
Wm. F. Hubbell, Wauseon, Ohio.
W. S. Hull, Chicago, Knapp Electrical Works.
Geo. A. Harker, St. Louis, Mo.
A. R. Hall, Denver, Colo., Diamond Incandescent Lamp Company.
J. E. Hall, Pittsburgh, Pa., Ft. Wayne Electric Company.
H. H. Jackman, Chicago.
Herbert Jackson, Covington, Ky.
Lee Jordan, Hawkinsville, Ga.
H. W. Korhammer, Webster Grove, Mo., Suburban Electric Light Company.
J. R. Knowland, San Francisco, Cal.
Thos. J. Keech, Ann Arbor, Mich.
Lionel Leskovie, London, England.
Edwin T. Lawrence, Baltimore, Md.
W. B. Lucas, Phillipsburg, Pa.
F. C. McLean, Toledo, Ohio.
G. S. Meyers, Auburn, N. Y.
M. C. D. Martin, Columbus, Ohio.
James H. Mason, New York.
Alfred Mark, Wheeling, W. Va.
J. A. Malloy, Boston, Mass.
C. W. McKibben, Lima, Ohio.
Geo. Mitchell, La Grange, Ga.
M. L. Newton, Shelburne Falls, Mass.
M. F. O'Connor, Towanda, Pa.
Chas. L. Pickerun, New York.
J. B. Pillsbury, Bangor, Maine.
W. E. Richardson, Byron, Cal.
A. Richardson, Byron, Cal.
Oscar H. Roetkin, Covington, Ky.
F. A. Skilton, Auburn, N. Y.
J. N. Smith, Toronto, Ont., Ball Electric Light Company.
Chas. Solomon, Oaxaca, Mexico.
Samuel W. Skiller, Sidney, Ohio.
Geo. A. Skene, Lawrence, Ala.
E. Sullivan, New York.
J. G. Slonecker, Topeka, Kas.
John H. Sullivan, Elmira, N. Y.
John H. Stevenson, Jr., New York, Long Distance Telephone.
C. R. Truex, New York, Long Distance Telephone.
R. T. Twescher, New York.
H. A. Truitt, Philadelphia, Pa.
Joe. Ullam, Athens, Ohio.
F. H. Wilkens, Charlestown, Mass.
W. T. White, Knoxville, Tenn.
R. Woolson, Mt. Pleasant, Iowa.

The town board of the town of Flatbush, L. I., met last week, and it was resolved that sealed proposals for lighting the streets, avenues and highways of the town would be received at the town clerk's office up to the 24th instant. The number of gas lamps required is 1,500 and the number of electric lights 300.

ELECTRIC RAILWAY AND POWER NOTES.

The sale of the North Dallas, Tex., Electric Railway for $25,000 has been approved, and it was turned over to the Queen City Railway Company, which will operate it in the future.

The electric cars will commence running between the Rockland and North Abington, Mass., stations this week. Two cars will be run on 15-minute time. The line to Whitman village has been completed.

The officials of the West End Street Railway, of Rockland, Mass., have decided not to equip their cars with heating apparatus for the present. This decision is the result of many experiments made last winter, none of which proved satisfactory to them.

The Winchester Avenue Electric Railroad, of New Haven, Conn., started last week on their new car building, which is to be erected on Meadow street. The building it is estimated will cost about $12,000, and will be made large enough for the storage of 30 cars. All the city cars will be stored in the building when it is finished.

Work of building the Beaver Meadow, Hazleton and Mahanoy City Electric Railway, one of the longest electric roads in Pennsylvania, will be continued. The preliminary injuncton against their occupying or infringing on public road of Schuylkill County was discharged last week. The road will be run from Beaver Meadow to Mahanoy City and thence probably to Pottsville, a distance of about 40 miles.

The directors of the Troy, N. Y., City Railway Company are now preparing plans for the new bridge which will cross the river from the foot of Douw street in that city to the upper end of Green Island. A sub-committee is at work among the residents near whose property the bridge or the approaches will touch, and as soon as their views on the subject are obtained the company will advertise for bids for constructing the bridge. All the preliminary work possible will be finished before winter.

The new line of the Calumet Electric Railway, giving Pullman, Ill., direct communication with the World's Fair, was opened last week. The first car was sent over the new branch in the afternoon, having on board President Jacobs and a number of invited guests. The tracks from the Fair Grounds to Ninety-seventh street have been laid some time, the new portion of the route being from the Ninety-seventh street junction at Stoney Island avenue to Pullman, which is reached in a zigzag course. The road was found to be in good condition.

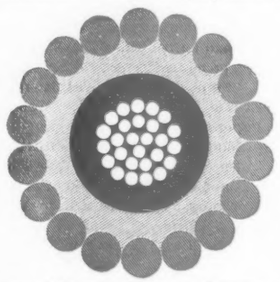
Last week the biggest leather belt in the country was set running. It is 80 inches wide, and this is said to be eight inches more than any other ever made. The Toledo Electric Company adjusted it to its 1,600 horse-power engine. For two or three days the engine will be tested, then all of the machinery will be removed from the old plant and the electric station put into full operation. It is a well equipped building, one of the best in the States, and one of the best built by the General Electric Company. The engine which works the huge belt is a compound condenser, known as a Lake Erie vertical, made at the Lake Erie Engineering Works, of Buffalo. In the engine room the foundation is in for another 800 horse-power engine.

The Electric Traction Company, of Philadelphia, Pa., organized for the purpose of trolleying the various lines operated by the Frankford and Southwark system, practically assumed control of the newly acquired properties last week. The stockholders of the Frankford and Southwark and its leased lines, the Second and Third and Tenth and Eleventh, at meetings held a short time ago, consented to the transferral of their lines from the Frankford and Southwark to the Electric Traction. Under this lease the Electric Traction Company now controls about 85 miles of street railways, and comes into possession of one of the most valuable franchises in the city. The work of trolleying the lines will begin as soon as practicable.

Gutta Percha in Cable Work.

Although the hard times have practically stopped building the Bishop Gutta Percha Company report that they are able to keep their regular force employed full time. They are largely engaged at present on drawbridge and river cables for electric light and railways. Although cheap insulation may answer for ordinary feeders it is not much use under water.

We give an illustration of a cross section of a 000 cable insulated with gutta percha, of which the Bishop Company sent 3,000



BISHOP 000 GUTTA PERCHA SUBMARINE CABLE.

feet to Tacoma to bring power under the bay to the city from water power on the other side.

On account of the liability of gutta percha to injury by exposure to the sun, the Bishop Company now uses for drawbridge and river work a special rubber compound applied in three coats, each being different. The first is pure rubber, the next a rich rubber compound without sulphur, and then a vulcanizing compound. Over these are heavy double tapes, then tarred hemp for cushion, and then heavy iron armor. They have recently made several of these cables for the Haverhill and Groveland Railway crossing the Merrimac river, and for the Union Railway Company, of Providence, R. I.

The Narragansett Electric Light Company, of Providence, has used Bishop cables for crossing to East Providence for several years, and have just ordered five more. The Bishop Company has been in luck during the past year, having been called on to devise and manufacture several special styles of cable for the government, amongst them an "out-post cable," of which a scout carries one-half a mile on a reel on his back, from which it is paid off as he proceeds, and by it he is kept in telephonic communication with headquarters. Although this cable has two conductors (being concentric), and is very strong, a mile of it weighs only 50 pounds. One of these out-post cables, made extra strong by using fine steel wires for return circuit, and linen braid instead of cotton, has been sent to Chicago as a part of the government exhibit of this company.

The Light House Department also exhibit at the Fair several samples of Bishop cables used in lighting the buoys at Sandy Hook and in New York harbor, as well as the line of electric buoys, 13 in number, which were placed in Lake Michigan, to light the pathway for steamboats plying between Chicago and the Fair Grounds.

Thus far the Bishop Company has designed and made all the cables used for electric buoys in this country and we understand that they have not been tried by any other government. They have proved a great success here. The 6½ miles of cables made by the Bishop Company last fall for the Weather Bureau have just been laid to connect two islands in Lake Huron with the main land near Alpena, Mich. These are the cables which it was said could not be made at reasonable price on account of the effect of the McKinley bill, but they were made and laid for less money than was estimated for their cost before the McKinley bill was passed—$10,500.

Hereafter the price paid by the city of Providence, R. I., for each of the street lights furnished by the Narragansett Electric Lighting Company will be 38⅓ cents, instead of 44 cents, the price prevailing up to the time the new contract was entered into, last October.

A New Lamp.

THE PENNSYLVANIA ELECTRIC ENGINEERING COMPANY BRING OUT "MAGGIE MURPHY."

The accompanying cut is a *fac simile* of the new "Maggie Murphy" lamp, which has just been brought before the public by the Pennsylvania Electric Engineering Company, Penn Mutual Building, Philadelphia. The construction of the lamp, as shown by the illustration, consists of a receiver made partly of glass and partly of cement. The cement is placed in the neck of the bulb, through which the leading-in wires pass. It was found in making the experiment with this cement that it was very difficult to overcome the softening of same, caused by the heat from the leading in wires, which are made of iron. This is obviated by the placing of four small disks on the leading-in wires, two on each one, the same being insulated by two mica plates, one above and one below. These disks radiate the heat from the leading in wires to such an extent that disintegration of the cement stopper is impossible, and the lamp is said to be the coolest burning lamp on the market. By reason of the receiver not being made entirely of glass, and the leading-in wires not passing through, both of these points being sustained by Judge Wallace in the case of the Edison Company against the Sawyer-Man, the claim is boldly

THE "MAGGIE MURPHY" INCANDESCENT LAMP.

put forth that this is undoubtedly a non-infringing lamp.

No doubt the public will appreciate this, and gladly welcome the birth of the Maggie Murphy lamp.

World's Fair Prize Winners in New York City.

The public of New York who are unable to attend the World's Fair in Chicago are to be given an opportunity to see the best exhibits, those which have taken the prizes, through the efforts of the Manhattan Industrial Exhibition Company, who propose to hold an exhibition in the Grand Central Palace, in January next.

The object of this exposition is to reproduce, as far as practicable, the prominent and most attractive exhibits at the World's Fair. The Grand Central Palace, with its 400,000 square feet of floor space, has been secured for the purpose. Here an opportunity is offered those firms in New York, who for one reason or another did not participate in the World's Fair, to make an exhibit and display of their goods, to perhaps as great if not greater advantage than at Chicago.

As a strong effort is being made to interest the principal exhibitors at the World's Fair in the undertaking, it is to be hoped that our merchants will be alive to the possibilities of the situation and will not let others crowd them out of their own stamping ground.

It is proposed to fix the price of admission at the popular figure of 25 cents, which alone ought to be sufficient inducement to attract many thousands of people. Further information in regard to the Exposition can be obtained by addressing the office, 122 West 23d street, New York.

ELECTRIC LIGHT FLASHES.

The inauguration of the new arc light system, at Franklinville, N. Y., is announced to take place this week.

The electric light plant at Peterborough, N. H., is nearly done, and the light will be turned on in a few days.

The Rochelle, Ill., council has appropriated $10,000 for an electric light plant, to be provided for by bonds payable in 10 yearly installments.

The Dayton, Ohio, Electric Light Company are pushing the completion of their new plant, and are giving discounts on all bills reaching out for new business.

The Westbrook Electric Light Company is putting in a 1,000 light dynamo for lighting East End and the city of Deering, Me., with incandescent lights. The plant will be in operation shortly.

If the electric street railway company gets permission to lay its rails in the avenue on Barrie street, in Kingston, Ont., they will make it a very interesting place. It is proposed to light the avenue with incandescent electric lights.

The citizens of Randolph, N. Y., are discussing the question of having electric lights for street lighting. They had a meeting with the village trustees last week, but no action was taken, as no satisfactory figures could be furnished.

The selectmen of Rockport, Mass., have contracted with the Gloucester Electric Light Company to light the streets, beginning October 1. They are to be lighted 252 nights in the year, and they are to have 125 twenty-five candle-power incandescent lights.

The electric light company, of Geneva, N. Y., is making preparations for extending its low tension current through South Main street for the purpose of lighting with electricity the private houses of those who wish to use it instead of gas. The company has already put this mode of lighting in some of the Torrey Park houses.

The Georgia Electric Light Company, of Atlanta, is now installing two new power generators of the largest type to meet the increasing demand for power which, within the past year, has grown enormously. When these machines are in running order, which they will be in a few days, the company will then be able to supply current for motors of any capacity.

The Binghamton, N. Y., General Electrtc Company has received and is placing in position a 350 horse-power compound tandem engine of the McIntosh and Seymour pattern. It will also place, during this week, two Armington-Sims 300 horse-power compound engines. Within the next two weeks the company will have all of the machinery from its Water street plant at the new station on Court street. When finished it will be one of the most complete and modern light and power stations in the country.

In the United States Court of Baltimore recently, Judge Lacombe refused to grant a preliminary injunction in favor of the Edison Electric Light Company and the United Electric Light and Power Company. The Edison Company brought the suits for injunctions on the ground of infringements on its incandescent lamp. Judge Lacombe said that it appeared to him that the Edison people intended to hold this recently patented lamp as a whip over all the people in the electric light business in the United States. In other words, they meant that no one should go into the electric light business without using that particular lamp; that they must get all their dynamos, lamps and equipments from the one place, and if their plant had been furnished by another concern in order to do business and use the lamp in question, they must tear out their entire plant and put in a new one. He did not think this was fair, and ordered a peremptory adjournment until the term following that of the 15th instant.

Two Progressive Electrical Workers.

The REVIEW is pleased to present the portraits of two careful electrical inventors and workers on the staff of the Beacon Vacuum Pump & Electrical Company, of Boston.

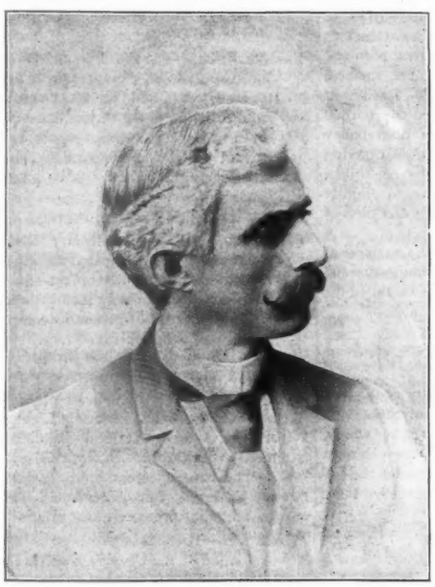
William Emery Nickerson is of old New England stock, and was born in Provincetown, Mass., November 5, 1853. He graduated from the high school of that place. He graduated from the Massachusetts Institute of Technology in 1876, in department of chemistry. He was for several years instructor in the chemical laboratory of that institution, and private assistant to Professor Nichols, now deceased, for whom he did a large amount of work on analysis of water from many parts of Massachusetts, and of air from schools, prisons and railway trains, in the interest of the State Board of Health. In the years 1877–80 he gained a reputation among the leather manufacturers having headquarters in Boston as an expert in matters relating to the leaching of tan bark, the estimation of tannic acid, and other matters appertaining to leather manufacture from a scientific point of view. Although educated as a chemist, he has had a large experience in applied mechanics, having designed and built an extended variety of machines and mechanical appliances.

He has given a great deal of attention to inventions and improvements and his name appears upwards of a hundred times in the list of American patents. He has also familiarized himself with the practice before the Patent Office, and always writes his own patent specifications, as well as many for inventive friends, and is said to be usually successful in drawing specifications and claims which thoroughly define and cover the invention.

He discovered the principles on which the non-mercurial vacuum pump of the Beacon Company operates, and is the perfecter and chief inventor of that now famous machine.

The Beacon Company looks principally to him for the solution of its mechanical and chemical problems. He does not claim to be an electrician, although he is by no means ignorant of electrical matters.

He is an inventor by nature and finds it impossible to keep his mind from being engaged in trying to produce something new and better in the industrial arts.



WILLIAM EMERY NICKERSON, OF THE BEACON VACUUM PUMP & ELECTRICAL COMPANY, BOSTON.

EDWARD E. CARY, OF THE BEACON VACUUM PUMP & ELECTRICAL COMPANY, BOSTON.

EDWARD E. CARY.

Edward E. Cary was born in Albany, New York, February, 1866. His early life was passed in New York city and Brooklyn. He graduated from the Brooklyn Polytechnic Institute in 1884, and was, in the years 1883–5, private assistant to Prof. Robert Spice, of Brooklyn.

Three years were then passed as assistant in the Newark laboratory of Edward Weston. In 1888 he entered the employ of the Westinghouse Company, and remained in the Pittsburgh lamp factory three years. June, 1891, found him engaged on special filament work in the Twenty-third street factory of the Westinghouse Company in New York city.

At this time he saw an opportunity for future advancement with the Beacon Company in Boston, and accepting an offer from them, took charge of the lamp manufacturing department of their business, which position he still holds.

Mr. Cary, although young in years, is rich in experience in the art of incandescent lamp making. It is much to be doubted if he has a superior in the manipulation of incandescent filaments. His natural talent, thorough education and large experience have made him a master of this art. The high standard of excellence attained by the "Beacon" lamp was due in no small degree to the perfection of the work in his department.

The fact that the "New Beacon" lamp will be provided with filaments made under his direction, and will be exhausted on the patented pumps of the company, ought to be taken as a sufficient guarantee that it will hold a high place as the "Beacon" lamp did before it.

Don't Loan Your Telephone.

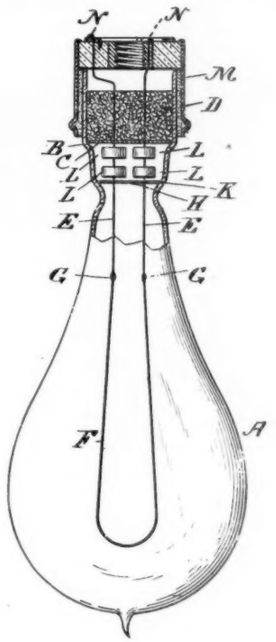
The telephone closet of many merchants in New York is the receptacle of the coats and waistcoats which are doffed in hot weather by employers and employés. A well dressed and well appearing young man has been taking advantage of this fact lately. With a nonchalant air he has asked to use the telephone. When it has been accorded him, after ringing up "Central" and conducting an imaginary conversation with a mythical person, he has stolen the contents of the pockets of the coats and vests in the telephone closet. His last haul was a gold watch and chain and $18 in cash, which he took from the waistcoat of a merchant down town.

Linemen Arrested for Assault.

John Burke and Charles Chicks, two linemen employed by the New York and New Jersey Telephone Company, were indicted in Brooklyn recently, charged with assaulting Robert Stewart, a non-striking lineman, in May last. This assault was made in New Jersey at the time of the recent strike of linemen, and since then the company has been quietly hunting for the men, and now possess abundant proof of their cowardly assault. Stewart was badly hurt, but has nearly recovered. The Telephone Company is deserving of much praise in punishing such fellows.

The "New Beacon" Incandescent Lamp.

The diagram we present shows the general construction of the "New Beacon" lamp, owned by the Beacon Vacuum Pump and Electrical Company, of Boston. The glass globe of the lamp A is provided with a shoulder at B upon which rests a thin disk of mica C. The disk serves as a support for a body of cement, the composition of which is not disclosed, which is poured, in a fused state, upon it, and completely fills the upper part of the neck of the lamp. This cement is of a novel composition, and is not only absolutely impervious to air itself, but makes an equally air tight union or joint with the glass surface of the lamp neck. It is able to withstand the temperature to which it is subjected in the operating lamp without leaking or giving off any gases or vapor whatsoever. It achieves results which, although often sought, have never before been accomplished. The leading in wires E E, which are of iron throughout, pass through this cement and through the mica disk C, but nowhere touching the glass of the enclosing globe, and are connected with the filament or burner F at G G. A second disk of mica H is located within the neck of the lamp globe and rests upon the shoulder K. The disk H acts as a reflector and throws back the heat of the filament, thereby keeping the cement plug from being affected.



THE "NEW BEACON" INCANDESCENT LAMP.

Upon the leading-in wires between the two mica disks are placed small bodies of metal, LLLL, called radiators. They are so called because they take up the heat of the leading-in wires and disperse it by radiation, preventing it from being carried into the cement plug. They are a very neat and effective device for the purpose which they accomplish.

The lamp neck is surmounted by a cap or base, M, of the ordinary kind, fastened in place by plaster of paris, and to which the leading-in wires are attached by soldering at N N.

While the lamp is burning the cap and socket are nearly as cool as when it is not in operation, a phenomenon not known in other lamps, and the candle-power holds up in the same remarkable manner as it did in the old "Beacon" lamp.

The new lamp cannot be excelled for cheapness of manufacture, and, with its unsurpassed qualities, can scarcely fail to become a popular favorite.

The inventors, as well as the Beacon Company, are justly proud of the achievement, and believe that they have very nearly attained perfection in the development of an economical and efficient lamp of the modern incandescent type.

Copper Smelting in Russia.

At the Bozoslovsk Works in Russia, purchased from the Crown by the present proprietor, Mr. Polovtzof, about 10 years since, the converters in the Bessemer shops are arranged in two groups of four, each group having two reverberatory smelting furnaces. When in use one converter is blowing, a second is under repair, a third is cooling, and the fourth warming up. The operation is performed in two stages; in the first the coarse metal, by the elimination of sulphur and iron, is reduced to fine metal, and in the second the sulphur in the latter is oxidized, bringing it to the state of blister copper. In the first operation 3,200 pounds of coarse metal, with 20 per cent. of copper, melted in a reverberatory furnace, is run into the converter and blown for 25 or 30 minutes. By the burning of the sulphur and iron the temperatures rises rapidly, and a yellow flame, with violet edges and filled with very bright sparks, issues from the mouth of the converter. As the iron decreases the flame drops, and finally becomes green, when the operation is finished and the charge is poured into molds, where the slag and regulus separate in cooling. The latter averages about 64 per cent. of copper.

In the second operation the white metal of the first blowing is remelted and blown to blister copper; this requires a longer time and is less easily effected than the first conversion, as the only combustible constituent, sulphur, gives such a small amount of heat that there is danger of the charge setting. It is, therefore, necessary at times to raise the temperature by throwing in charcoal, and two men are continually engaged in keeping the tuyeres open with iron prickers. The blow lasts from 1 to 1½ hours, and is considered to be finished when no unchanged regulus is found in the projections collected on a shovel inserted into the converter. The flame, which is at first green, changes at the end to a reddish-yellow. The slags containing five to six per cent. of copper are poured out first, and afterwards the blister copper, which is refined in the reverberatory furnace in the usual way.

In the same converter three or four consecutive blows for white metal are followed by two for blister copper, and two or three more for white metal, the object of the alternation being to remove any masses of copper adhering to the lining. The average assay of the blister copper from the converter is 96 per cent. In 1890, 5,013 tons of 19 per cent. coarse metal were converted in 3,825 blows into 1,549 tons of white metal, and the latter by 887 blows into 746 tons of blister copper.

Electric Cables.

A PAPER ON THE CARRYING CAPACITY OF ELECTRIC CABLES, SUBMERGED, BURIED, OR SUSPENDED IN AIR—READ BEFORE THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES, AT CHICAGO, AUGUST, 1893.

BY A. E. KENNELLY.

I.

The general laws that control the temperature elevation of electrically active wires, when buried or submerged, seem to have been fully ascertained, but the application of the theory to practical conditions has not perhaps been sufficiently developed. Professor George Forbes has, however, in his paper on the hearing of conductors, read before the London Institution of Electrical Engineers in March, 1884, considered the cases of wires in air and water, as well as of wide horizontal plane strip conductors buried underground. It is here proposed to further develop the subject, with the aid of a series of measurements made at the Edison laboratory on particular samples of Siemens cable manufactured at the Schenectady works of the General Electric Company. These measurements are described in appendix 1.

We may commence with the simplest case of a solid cylindrical conductor of radius R cms., carrying a steady current of C amperes with a resistivity at the working temperature of κ ohms. The conductor is covered to radiud R cms. with a solid insulating material, closely fitting over which is a tube or cylindrical sheathing of lead or other metal. The electrical resistance of the conductor per centimetre of length is $\rho = \frac{\kappa}{\pi r^2}$ and the heat generated by the current in the same unit length is $C^2\rho$ Joules per second corresponding to a thermal activity of $C^2\rho$ watts.

If the surface of the cable's sheathing is kept at a constant temperature t° centigrade, by the action of flowing water, it can be shown that, in the copper conductor, there will be no sensible difference of temperature between the center and the surface for all cases that are likely to occur in practice. Similarly the difference of temperature between the interior and exterior surfaces of the leaden sheath will be negligible, so that finally, after the current has been kept steadily flowing through the conductor for what would be strictly an infinitely long time, but for practical purposes might be an hour, we may consider that while the sheath would retain throughout a uniform temperature t° C., the copper would have reached a steady temperature of $t+\theta$ throughout its substance, θ being the temperature elevation of the conductor due to the current it conveys.

This temperature elevation θ depends upon the thermal resistance offered by the insulator to the transfer of $C^2\rho$ Joules of heat energy across unit cable length of its substance per second. With infinitely great thermal conductivity or infinitely small thermal resistance, the insulator would transfer heat under an infinitely small temperature elevation; and generally, if S is the thermal resistance of a body between two surfaces whose difference of temperature or thermal potential is θ° C. (referred, strictly speaking, to the centigrade scale of the air thermometer) the transfer of heat in the permanent state between those surfaces will be

$$H = \frac{\theta}{S} \qquad (1)$$

heat units per second.

It is customary to express H in grammecalories, *i. e.*, water gramme degrees centigrade, but for the purposes here in view, it is preferable to express the heat in terms of its equivalent mechanical energy, with the Joule as unit.

The thermal resistance of a body depends upon its form and its thermal resistivity, in complete analogy with the corresponding electrical quantities. A homogeneous isotropic substance possesses, therefore, unit resistivity, when a centimeter cube with 1° C. difference of temperature maintained between two opposite faces, allows one Joule of heat energy to pass between them, in the permanent state, each second. If σ denotes the thermal resistivity of the insulator in the cable of radii r and R, the thermal resistance of the covering per centimeter of length of cable is

$$S = \frac{\sigma}{2\pi} \log_e \frac{R}{r} \qquad (2)$$

and by analogy with Ohm's law, the temperature elevation will be the product of this resistance and the energy current H or $(C^2\rho)$ developed in each centimeter. Thus,

$$\theta = H \qquad (3)$$

$$\text{and } C = \sqrt{\frac{\theta}{\rho S}} \qquad (4)$$

This relation (4) determines the limiting current strength for the cable, when the radii and resistivity of the insulator are given, and the temperature elevation has been decided upon.

The temperature elevation permissible in the conductor of a cable is generally limited by the attendant diminution of insulation resistance, or the softening of the insulating material. For Siemens' cables, 60° C. may be taken as a fair limit in this respect, and since the normal temperature of air or soil may reach 35° C. in summer, the sage limit of temperature elevation will be 25° C. or 45° Fahrenheit.

With this value of θ in equation (4)

$$C = \sqrt[5]{\frac{5}{\rho S}} \qquad (5)$$

$$\text{or developing } C = 5\,r \sqrt[5]{\frac{2\pi 2}{\kappa\,\sigma \log_e \frac{R}{r}}} \qquad (6)$$

κ and σ being the electrical and thermal resistivities, ρ and s the electrical and thermal resistances per centimetre of length, R and r the radii, and the conductor a solid cylinder.

This shows that if the thickness of the insulating cover maintained a constant ratio to the diameter of the conductor, the limiting current strength would be directly proportional to the radius, that is, to the square foot of the cross sectional area of the conductor. In that case doubling the diameter of the wire would quadruple its cross section, but only double the carrying capacity. It is evident, however, from an examination of the dimension tables for any kind of electrical cable, that the thickness of insulator does not usually increase in proportion to the diameter of the wire, and consequently the carrying capacity will generally increase faster than the radius and slower than the cross section. For the standard Siemens' cables it appears that quadrupling the cross section of the conductor increases the carrying capacity about three times.

The resistivity of copper at 60° C. may be taken as two michroms, and from the measurements of the samples of Siemens' cable tested, the mean thermal resistivity of the insulator was 750 units.

As an example, suppose a No. 4 B. & S. wire 0.2043" (0.52 cm.) in diameter, covered with Siemens' compound to a thickness of 0.1" (0.254 cm.), lead sheathed, and submerged in water, required the safe carrying capacity.

In equation (2) σ=750, R=0.514 + =0.26
R/r=1.977 log (R/r)=0.6816

$$\therefore S = \frac{750}{6.283} \times 0.6816 = 81.36$$

$$\text{Also } P = \frac{0.000002}{3.1416 \times 0.26 \times 0.26} = 0.000009417$$

$$\therefore C = \sqrt[5]{81.36 \times 0.000009417} = 180.7 \text{ amps.}$$

STRANDED CONDUCTORS.

If the copper conductor consists of a strand of copper wires, equations (4) and (5) remain applicable, but (6) is no longer reliable. Taking (5), the resistance of the conductor per cm. can be determined in the ordinary way, and the thermal resistance of the insulator can be best found by taking its mean internal diameter for r in (2). The insulating cover surrounding and conforming to such a strand is no longer simply cylindrical, but the slight additional accuracy in determining the thermal resistance for the new interior outline would not repay the additional labor of computation.

BURIED CABLES.

The case of buried cables differs from that of cables submerged only in the fact that the external surface of the sheathing is not maintained at the normal temperature of the environment. The ground, in fact, interposes an additional thermal resistance to the flow of heat from the active conductor. Denoting this ground resistance by G, the fundamental equation (1) becomes

$$H = \frac{\theta}{S + G} \qquad (7)$$

so that it is only necessary to increase the thermal resistance of the insulator by that of the soil to revert to the same method of treating the problem.

Assuming that the cable lies buried at a uniform depth below the level surface of the ground, the thermal resistance G of the soil will, for a given external cable diameter, depend only upon this depth and upon the thermal resistivity of the soil. We may consider that the temperature of the surface of the ground remains normal, and that owing to the combined actions of radiation, convection and wind, the heat flowing upwards from the buried cable is entirely dispersed and dissipated at this surface. This is, of course, not strictly true, for the surface temperature of the grouud immediately over the cable will rise appreciably when powerful currents are steadily carried beneath. It may be shown, however, that with the depths at which cables are usually buried, the assumption involves an error that is practically small, while it renders amenable to simple numerical treatment a condition that would otherwise be too complex to ordinarily compute. If, for example, a cable buried at a depth of one metre were of such dimensions as to carry safely a steady current of 750 amperes, the final elevation of temperature at the surface of the ground over it would be less than two degrees C., even ignoring the great reducing influence of wind, and the ground surface, which, by assumption, should remain at normal, could nowhere exceed the normal by two degrees centigrade, a discrepancy whose consequence upon the carrying capacity of the cable would be negligible, and whose tendency would be to slightly underestimate the temperature elevation of the conductor.

On this assumption, then, the surfaces of heat flow are cylindrical, and the isothermal surfaces are also cylinders eccentric to the conductor. The thermal resistance

$$G = \frac{g}{2\pi} \log_e \left(n + \sqrt{n^2 - 1} \right) \qquad (8)$$

where g is the thermal resistivity of the soil, and n is the ratio of the depth of the cable's axis to the cable's radius, or in other words, the depth of the center of the cable in external radii. From this formula the following table and the curve in Fig. 1 are obtained.

n	Co-efficient of g	n	Co-efficient of g
10	0.4760	110	0.8584
20	0.5871	120	0.8730
30	0.6516	130	0.8850
40	0.6975	140	0.8968
50	0.7330	150	0.9078
60	0.7620	160	0.9181
70	0.7865	170	0.9277
80	0.8077	180	0.9368
90	0.8265	190	0.9454
100	0.8433	200	0.9536

(To be continued.)

Wants Damages for Its Chopped Down Light Lines.

An action was begun last week by the Manhattan Electric Light Company, limited, against the city of New York to recover $56,571.35 damages occasioned by the removal of the company's pole line and overhead wires on the Bowery and other streets in 1889. The company declare that no subways were provided for their wires.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Electric Railways.

MIDDLETOWN, MD.—Assurance is given by parties in authority that the delay in commencing the proposed Frederick and Middletown Electric Railway is but temporary, and that the road will undoubtedly be built.

BAYONNE, N. J.—A franchise to substitute the trolley system for horses in Bayonne has been granted to the Jersey City and Bergen Railway Company. The Bayonne City Rapid Transit Company asked for a similar franchise, but the application was refused.

ASHVILLE, N. C.—The plant, rolling stock and franchises of the Ashville Street Railway Company will be sold at auction September 6, by A. Summey, Master Commissioner.

SALT LAKE CITY, UTAH.—Otto Stallman and Stephen A. Estes have been granted a franchise for an electric street railway to Warm Springs.

ELWOOD, IND.—The Elwood Electric Street Railway Company will extend its lines to Alexandria.

FRANKLIN, PA.—The Franklin and Oil City Electric Railroad Company will apply for a charter to build an electric railway from Franklin to Oil City, a distance of seven miles. The directors are James Roy, H. R. McCalmont, J. H. Donley and George S. Davis.

Electric Light and Power.

SALISBURY, MD.—The Salisbury Electric Light and Power Company, showing no inclination to rebuild its plant—burned last year—will probably forfeit its franchise, which will be given to a company which will build a plant at once.

BELDING, MICH.—The Spencer Electric Light and Power Company has been incorporated with a capital of $50,000.

BALTIMORE, MD.—The Domestic Light and Power Company, capital $50,000, has been formed to furnish electrical equipment for incandescent lighting and for the operation of machinery. R. Jerome Aiken is the promoter.

YORK, PA.—There is a prospect of a consolidation of the People's Electric Light Company with the Edison Company.

LA CROSSE, WIS.—The city council has appointed a committee to investigate and report on the advisability of the city having its own electric lighting system.

ELGIN, ILL.—V. W. Panton, of South Elgin, is an applicant for a franchise to build an electric light plant here.

New Manufacturing Companies.

CHARLESTON, W. VA.—The Economy Novelty Company has been incorporated for the purpose of manufacturing and dealing in electrical appliances. The incorporators are J. Duncan Harris, E. C. Legg, R. A. Dalshiel and Robert H. Hooper, all of Baltimore, Md.

STAFFORD, CONN.—The capital of the Hyer Sheehan Electric Motor Company, of Stafford, has been increased from $25,000 to $30,000.

KINDRED INTERESTS

The Eddy Electric Manufacturing Company, of Windsor, Conn., are very busy with special contracts. Like other factories just now general business is quiet with them, but they look for an improvement soon.

The Hart & Hegeman Manufacturing Company, of Hartford, Conn., recently issued an attractive catalogue of the well known Hart switches. The catalogue is artistically illustrated and should be in the hands of every switch user.

The Buckeye Iron and Brass Works, of Dayton, O., have a fine exhibit of their goods in the Machinery Building at the World's Fair. The exhibit is located in the Annex, and all their friends are invited to call on them. This company manufactures brass goods for engine builders, steam and water fitters, etc.

The Central Electric Heating Company have issued their catalogue No. 1, containing descriptions of electric heating apparatus of every kind for cooking and for domestic and industrial purposes generally. Excellent half tones and wood engravings contribute to an understanding of the style and quality of their apparatus.

R. T. White, 12 Pearl street, Boston, Mass., has issued an illustrated catalogue in which will be found many points of interest to street railway companies. A careful reading of its pages will show that it contains descriptions of the latest and most improved appliances and track materials used in street railway construction.

Messrs. Smith & Wallace, 8 Oliver street, Boston, Mass., manufacturers of electric and railway supplies, are calling attention to a new electric snow plow made by them. Those electric railway companies contemplating the purchase of a snow plow would do well to begin early to make inquiries concerning the improvements which are constantly being made.

The S. S. White Dental Manufacturing Company, of Philadelphia, have issued a circular giving an account of the many advantages to be gained by the use of the Partz batteries and accessories. Feeling the need for a reliable primary battery for office use, they have undertaken the manufacture of this one, and reports seem to bear out the statement that it is quite reliable—a most essential feature of primary batteries.

General Electric Company.—A contract for three 1,500 kilowatt, multipolar railway generators has been awarded to the General Electric Company by the People's Traction Company, of Philadelphia. These generators will be of the same size and capacity as the immense machine now in the power house of the Intramural Railway, at the World's Fair, which is at present the largest dynamo in the world, and which is the highest expression of perfection in the science of dynamo building to-day.

Queen & Company, Incorporated, Philadelphia, are congratulating themselves upon the large number of "Magnetic Vane" ammeters and voltmeters which they have sold up to date this year. An increase of 200 per cent. over the first seven months of '92 is not a bad record, especially in the face of recent and present financial disturbances. The causes of this great advance are naturally accounted for in the high quality of the instruments and the remarkably low prices at which they are supplied. In consequence the makers have special contracts with several dynamo building companies to supply switchboard apparatus for the plants which they install, and also receive substantial orders from central stations, both light and power, and from the trade in general. Circular 420, giving prices and interesting particulars, can be had from them for the asking.

THE GENERAL ELECTRIC LAUNCH CO.
44 BROAD STREET, NEW YORK.
ELECTRIC LAUNCHES BUILT COMPLETE, $750 UPWARDS.
ELECTRIC EQUIPMENTS FOR ROW BOATS $ 320 UPWARDS.

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ELECTRICAL ENGINEER & EXPERT,
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PATENTS.
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Plans and Specifications for Interior Lighting Prepared, and Personal Supervision Given to all Work. Appraiser of fire losses on electrical apparatus.
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SECOND-HAND RAILS.
We own and offer for sale cheap about 150 tons of second-hand Steel Rails, all carefully selected for relaying, and practically as good as new. Write or wire at our expense.
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CARPENTER ENAMEL RHEOSTAT CO.,
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CHAS. D. SHAIN,
General Selling Agent,
136 Liberty Street, New York City.
These rheostats can now be supplied of any resistance and capacity on short notice. They are being largely used by such manufacturing concerns as the following: General Electric Company, Siemens & Halske Company, Interior Conduit & Insulation Company, Crocker-Wheeler Company, General Incandescent Arc Light Company, National Electric Company, Waddell-Entz Company, Western Union Company, Dahl Electric Company, and by central station companies and contractors all over the country.
Send for new catalogue and price list.

GONDA TRADE MARK BATTERIES.
YOU KNOW, perfectly well, that the GONDA TRADE MARK CELLS are the "Standard Open Circuit Batteries of the World" and THE BEST CELLS MADE. Many dealers will, however, urge upon you inferior Cells, because the profit in selling them is larger. DO NOT BE IMPOSED UPON! Refuse to take any Cell unless it is marked "GONDA," and if your dealer does not keep the Gonda Batteries in stock, send to us for circular and prices.
THE LECLANCHÉ BATTERY CO.,
111 to 117 East 131st St., NEW YORK.

HONORS TO THE
FORT WAYNE ELECTRIC CO.
ITS
DYNAMOS AND APPARATUS
HAVE BEEN SELECTED FOR MAKING
COMPARATIVE TESTS AT THE WORLD'S FAIR.

World's Columbian Exposition,
August 3, 1893.

FORT WAYNE ELECTRIC CO.,
Fort Wayne, Ind.

GENTLEMEN:—

I herewith hand you Memorandum of Conference on lamp tests. We are now busy getting everything in readiness. I am confident that the rigorous tests that will be imposed on our machinery will in no wise impair the good reputation that it now enjoys.

Very truly yours,

(Signed) E. A. BARNES.

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SYRACUSE, KIRK BUILDING.
PITTSBURG, 405 TIMES BUILDING.
COLUMBUS, OHIO, 57 EAST STATE ST.
SAN FRANCISCO, 35 NEW MONTGOMERY ST.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JULY 18, 1893.

501,485 Incandescent lamp socket; Henry P. Ball, Schenectady, assignor to the Edison General Electric Co., New York, N. Y.

501,488 Regulating electric locomotive; John B. Blood, Lynn, Mass., assignor to the General Electric Co., New York, N. Y.

501,491 Incandescent electric lamp; Edward E. Cary, Boston, Mass.

501,502 Incandescent lamp fixture; Alonzo T. Gifford, Hopedale, Mass.

501,524 Surgical lamp; Wm. G. Morgan, Fryeburg, Me., assignor of one-half to Gerry Morgan, same place.

501,529 501,530 501,531 Incandescent electric lamp; Wm. E. Nickerson, Cambridge, and Edward E. Cary, Boston, Mass.

501,532 Device for regulating constant current dynamo-electric machines; Olof Offrell, Middletown, Conn., assignor to the Schuyler Electric Co. of Connecticut.

501,533 Electrically illuminated character for advertising; Almon D. Page, Newark, N. J.

501,540 501,541 501,542 501,543 Electrical musical instrument; Paris E. Singer, London, England.

501,546 Automatic chain welding machine; Elihu Thomson, Swampscott, and Chas. E. Harthan, Lynn, Mass., assignors to the Thomson Electric Welding Co., of Maine.

501,547 Shaping and spinning metals by electricity; Elihu Thomson, Swampscott, Mass., assignor to the Thomson Electric Welding Co., of Maine.

501,548 Trolley wheel; Edgar M. Tousley, Jamestown, N. Y.

501,550 Electric body battery; Harry C. Wagner, Cleveland, O.

501,558 Electro-medical apparatus; John A. Cabot, Cincinnati, O., assignor of one-half to Frank H. Kirchner, same place.

501,578 Method of manufacturing varnish and apparatus therefor; Heinrich Pfanne, Rixdorf, near Berlin, Germany,

501,580 Electric lamp socket; Gustav Sachs, St. Louis, Mo.

501,589 Electrical measuring instrument; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co. of Connecticut.

501,600 Ear phone attachment; Chas. W. Faer, Chicago, Ill.

501,610 Transmitter for telephones; James A. Brown, Moline, Ill.

501,628 Apparatus for depolarizing in electrolysis; James C. Richardson, London, England.

501,631 Electric circuit connection for signaling or telephone boxes; John E. Smith, New York, N. Y.

501,676 Electric railway conduit; Irving J. Cook, Newark, N. J.

501,701 Electric controlling and locking mechanism for railway switches and signals; Charles M. Wilder, Cincinnati, O.

501,707 Electric switch; Wm. H. Dingle and John M. Urquhart, London, England.

501,708 Lightning arrester; Francis H. Doane, New York, N. Y.

501,723 Secondary battery; Frank King, London, England.

501,757 Electric arc lamp. 501,758 Carbon holder for electric arc lamps; Sigmund Bergmann, New York, N. Y.

501,768 Electric arc lamp; J. T. Dempter, Summit, N. J., assignor to Sigmund Bergmann, New York, N. Y.

501,777 Burglar alarm; Charles J. Fisher, Chicago, Ill.

501,778 Method of and apparatus for electrolyzing solutions; Eugene Hermite, Paris, and Andre Dubose, Rouen, France.

501,825 Method of and apparatus for heating, welding or working metals electrically; Charles L. Coffin, Detroit, Mich.

501,847 Multiple switchboard for telephone exchanges; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place.

501,849 Electric belt; Barney H. Standish, Evansville, Wis.

501,859 Method of preparing cables for multiple switchboards; Oro A. Bell, Brooklyn, N. Y., assignor to the Western Electric Co., Chicago, Ill.

501,861 Electric belt; Abraham D. Berliner, Rock Island, Ill.

501,884 Electric arc lamp; Wm. H. Klees, Susquehanna, Pa., assignor to himself and H. E. Outwater, same place.

501,905 Electric fire alarm; Chas. Bernhardt, Chicago, Ill., assignor to William H. Altman, same place.

ISSUED JULY 25.

501,911 Carbon holder for electric arc lamps; Sigmund Bergmann, New York, N. Y.

501,938 Carbon holder for electric arc lamps; Frederick D. Hazleton, New York, N. Y.

501,960 Commutator brush; Henry G. Reist, Lynn, Mass., assignor to the General Electric Co., Boston, Mass.

501,961 Means for regulating electric motors; Charles H. Richardson, Philadelphia, Pa., assignor to the S. S. White Dental Manufacturing Co., same place.

501,968 Electric railway trolley. 502,020 Electric locomotive; Elmer A. Sperry, Chicago, Ill., assignor to the Sperry Electric Railway Co., Cleveland, O.

501,996 Electrolytic bath. 501,997 Apparatus for the electrolytic extraction; Stephen H. Emmens, London, England.

502,007 Illuminated signs; Arthur L. McCormick, Port Huron, Mich.

502,022 Electric measuring instrument; Elihu Thomson, Swampscott, assignor to the General Electric Co., Boston, Mass.

502,040 Rheostat; Chas. A. Hussey, New York, N. Y.

502,077 Electrical measuring instrument; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co. of Connecticut.

502,088 Trolley wire and hanger; Earl P. Wetmore, Helena, Mont.

502,091 System of telephonic intercommunication; Frank R. Colvin, New York, N. Y.

502,098 Electric motor for rotary drilling machines; Robert M. Jones, Salt Lake City, Utah.

502,104 Electric switching apparatus; Arthur R. Roe, Duluth, Minn., assignor of one-half to George J. Northrop, Marquette, Mich.

502,105 Electric switching apparatus; Arthur R. Roe, Duluth, Minn.

502,157 Electric clock synchronizer; Arthur G. Wiseman, Webster Grove, Mo.

502,166 Electric arc lamp; Patrick J. Barrett, Boston, Mass., assignor of one-half to John J. Frawley, as president of the Boston Society of Redemptionist Fathers, same place.

502,207 Electric signal for fire alarm systems; Joseph Sachs, New York, N. Y.

502,215 Electric winding attachment for clocks; Arthur G. Wiseman, St. Louis, Mo.

502,216 Conduit systems for electric railways; Frank Wynne, London, England.

502,243 Electric railway trolley; Chas. J. Van Depoele, Lynn, Albert Wahl and Charles Coffin, executors of said Van Depoele, deceased, assignors to the Thomson-Houston Electric Co., Boston, Mass.

502,246 Combined phonograph and coin-operated mechanism; William S. Burnett, Milwaukee, Wis.

502,262 Telephone cable; Wm. R. Patterson, Chicago, Ill., assignor to the Western Electric Co., same place.

RE-ISSUES.

11,354 Dynamo or motor; Ralston C. Kintzing, Brooklyn, N. Y., assignor to the Crocker-Wheeler Electric Co., of New Jersey.

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FIG. 1.

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FIG. 2.

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